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ABSTRACT

Based on the premise that planning in writing is a strategic response to both the writing situation and the writer's own knowledge, this paper describes the process adult writers bring to ill-defined, expository tasks, such as writing essays, articles, reports and proposals. The paper also states that in planning, writers draw on (nest and integrate) three executive level strategies: knowledge-driven planning, script- or schema-driven planning, and constructive planning. Research in both instructional and academic writing which suggests that writers may fail to turn to a constructive strategy even when ill-defined tasks demand it is examined in the paper. Based on a detailed analysis of expert and novice writers, the paper presents a theory of constructive strategy and isolates five critical features in which writers must create a unique network of working goals and deal with the special problems of integration, conflict resolution and instantiation this constructive process entails. The paper also describes the strategies writers use to meet these demands and some expert/novice differences that affect the integration of the entire plan. The theoretical framework presented in the paper also suggests some goals for instruction and the support of planning. Ten figures and four tables of data are included; 57 references are attached. (KEH)

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Center for the Study of Writing

Technical Report No. 34

PLANNING IN WRITING: THE COGNITION OF A CONSTRUCTIVE PROCESS

Linda Flower, Karen A. Schriver, Linda Carey, Christina Haas, and John R. Hayes

July, 1989

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Linda Flower, Karen A. Schriver, Linda Carey, Christina Haas, John R. Hayes

Carnegie Mellon

Planning in writing is a strategic response to both the writing situation and the writer's own knowledge. This paper describes the process adult writers bring to ill-defined, expository tasks, such as writing essays, articles, reports and proposals. In planning, writers draw on (nest and integrate) three executive level strategies: knowledge-driven planning, script- or schema-driven planning, and constructive planning. Research in both instructional and academic writing suggests that writers may fail to turn to a constructive strategy even when ill-defined tasks demand it. This paper presents a theory of constructive planning based on a detailed analysis of expert and novice writers. It isolates five critical features of this constructive strategy, in which writers must create a unique network of working goals and deal with the special problems of integration, conflict resolution and instantiation this constructive process entails. The paper describes the strategies writers use to meet these demands and some expert/novice differences that affect the integration of the entire plan. This theoretical framework also suggests some goals for instruction and the support of planning.

I. Introduction

II. Planning and the Demands of a Writing Task
Executive Level Planning Strategies and Their Conditions for Success

III. Critical Features of Constructive Planning in Writing
Five Critical Features
1. Building an initial task representation
2. Generating a network of working goals
3. Integrating plans, goals and knowledge
4. Instantiating abstract goals
5. Resolving conflicts

Constructive Planning and Expert Writers

IV. Planning Aids for Writers: Goals for Instruction and Support

I. INTRODUCTION

Writing, in adults, is often a strategic and knowledge-transforming process. Consider some of the maneuvers that go on during planning, drafting, and revising an expository text: During planning, writers search for, organize and even transform knowledge, in response to the demands of a writing task or a social situation as they themselves construe it (Flower & Hayes, 1981; Flower et al., in press). In turning that plan into text, writers may have to translate an elaborate, abstract, or even non-verbal representation of meaning into a formal linguistic representation, couched in the particular conventions of the discourse community they hope to address (Odell & Goswami, 1982; Perfetti & McCutcheon, 1987; Witte, 1987). And finally, in revising that text, writers carry out a strategic process of detection, diagnosis, and repair in response to the problems and opportunities they discover (Hayes, et al., 1987; Flower, et al., 1986; Witte, 1983).

If writing were a straightforward, expressive rather than strategic, process, there would be little need for the adaptive search, rhetorical planning, linguistic manipulation, and problem diagnosis we observe in writers. And if the knowledge-telling process seen in children (Scardamalia & Bereiter,1987) were used to describe all writing, we would be unable to account for the significant transformations of knowledge one sees in adult text. The obvious limitations of the child's knowledge-telling process and the striking contrast to research with adults (Flower & Hayes, 1981) led Scardamalia and Bereiter (1987) to postulate the existence of a "knowledge-transforming" process that could achieve complex goals. The problem is, how exactly do writers manage this far more interactive and strategic process? This study attempts to fill that gap with a cognitive analysis of planning in adult expository writers.

In the paper we will present a descriptive theory of this planning process, based primarily on protocol data of expert and novice adult writers performing expository writing tasks. Its central premise is that planning is a strategic response to the task, as the writer sees it, and to the representation of knowledge the writer currently holds. As a result, this is a theory of how people negotiate the special demands of a socially embedded, situationally defined writing *task*. This means that if one wanted to use this perspective to account for *some given instance of planning*, one would have to recognize 1) what James Kinneavy has described as the "aims" of the discourse--that matrix of conventions and functions that lets us distinguish referential discourse, say, from poetic (Kinneavy, 1971). One would also have to recognize 2) the rhetorical and social context which not only elicits this act of planning, but which can shape its progress in the form of collaboration and feedback. And, finally, one would have to account for 3) the cognitive processes of the individual writer and planner, who negotiates these conventions and contexts to produce a unique text.

This paper offers a theoretical framework for describing this third, cognitive and strategic aspect of planning. In Section II we try to show how the planning process is often shaped by the social context of professional and academic writing--while it in turn affects success and failure in those situations. We try to complement this contextual analysis in Section III with a cognitive analysis that zooms in on the strategic moves of nine writers working on a shared task. Our process data can only reveal part of the strategic process we postulate, since it offers limited detail about the patterns of discourse and the social context in which these acts of cognition are embedded. Moreover, we do not want to suggest that the particular type of discourse we chose to observe is somehow "typical" of all expository writing. However, we felt that a sharp focus on cognition would let us achieve two worthwhile goals. One was to describe some broad, executive level strategies (such as knowledge-telling) that one might expect to recur across a range of writing aims and contexts, but in their recurrence to exhibit some revealing differences in when and how the executive strategy was used. Such differences could show us the way planning adapts to its context as well as the ways expert and novice writers in that situation plan. We see this framework as in part a tool for exploring variations. This cognitive analysis had another goal: In an effort to understand the ill-defined tasks one often encounters in professional and academic writing, we have thrown the spotlight on what we will call the "constructive" planning strategy. We concentrate on how this executive-level strategy played itself out in the task under study, not to suggest that all

writing will reflect these patterns, but to uncover some key elements of the constructive strategy itself and to provide a basis for future comparisons with other tasks and other writers.

The complex expository/explanatory writing tasks we discuss turn up in school and the workplace when people compose reports, proposals, instructions, essays and research papers. Consider what it normally takes to succeed on such tasks. Obviously, the *topic knowledge* (Anderson, 1985; Gould, 1980) the writer presents must be well-structured (which might require little or no planning from a subject-matter expert). However, mastery of a topic is often not enough. Writers must also manage a range of *discourse conventions* which place constraints on format, structure, and style. And in complex texts, such conventions can be ill-defined and negotiable, as in the conventions of "a good argument." Moreover, in order to make these texts work for the reader, writers may be forced to *generate* new information or a new conceptual framework, or to radically *restructure* their current knowledge. Planning is a response to these demands.

Expository writing tasks of this sort are good examples of what Reitman (1964) and Simon (1973) describe as an ill-defined or ill-structured problem--a problem for which there is no ready-made representation of the task and no standard solution procedure. The task could be justifying a policy decision, explaining a technical problem, or teaching a concept to students. The writer/problem solver must not only invent a plan of action (a solution to the rhetorical problem), but must also define those goals and criteria which themselves define the task (e.g., what will constitute a "good justification" in this situation?). Our understanding of the planning processes required to solve such ill-defined problems is limited, even though their importance to us is considerable.

The descriptive theory of planning proposed here is a theory of strategic choice operating under these normal but complex conditions. The writers we have observed appear to draw on three executive-level planning strategies we will describe as ***knowledge-driven planning, script or schema-driven planning,*** and ***constructive planning***, three strategies which expert writers typically *integrate or embed* within one another. The extensive research on comprehension and recall gives us some indication of how patterns of knowledge retrieval and schema-driven thinking (the basis of the first two strategies) might operate in planning a new text (cf. Lindsay & Norman, 1972; Schank & Abelson, 1977). We know far less, however, about how writers construct a unique and knowledge-transforming plan in the face of an ill-defined task. Because such tasks often force writers to construct goals and a plan of their own, our research has concentrated on describing the third, constructive strategy and its relation to the other two.

The paper will be organized around four questions:

1. **What does the task require?**
   Complex expository tasks often make special demands for the invention and restructuring of knowledge and for goal setting. In Section II we look in some detail at how the strategies of knowledge-driven, schema-driven and constructive planning are called for in professional and academic work. Examining the constructive strategy in this context suggests that it is a high-effort move that may be required by the task more often than is realized.

2. **How do writers manage the process of constructive planning?**
   In Section III, process analyses of expert and novice writers point to five critical areas of planning in which we can distinguish constructive planning from other planning strategies such as knowledge-telling, schema-filling, and opportunistic planning.

   1. Building an initial task representation
   2. Generating a network of working goals
   3. Integrating plans, goals and knowledge
   4. Instantiating abstract goals
   5. Resolving Conflicts

3. **What are the differences in the strategic planning processes of expert and novice writers on these ill-defined tasks?**
This exploratory research has lead us to strong hypotheses about some of the sources of the expert writer's strategic advantage, particularly in the way experts carry out the processes of initial task representation, integration of goals, and conflict resolution.

4. **What sort of planning aids might improve writers' performance?**
This analysis of expert planning, novice problems, and the demands of the task allows us, in Section IV, to suggest some goals for expanding and for supporting writers' planning processes.

II. PLANNING AND THE DEMANDS OF A WRITING TASK

Writing, in general, can be understood as an ill-defined construction task of the sort seen in musical composition, architecture, or design (Ballay et. al., 1984; Hayes in prep.). That is, the problem-solver is not only building his or her own representation of the problem and its goals, but the problem or task itself changes as the constructed product grows. The writer's draft and the designer's sketch feed new constraints back into the planning. However, the process of construction and the amount of adaptive planning a writer must do varies in some important ways.

1. Some writing tasks, such as writing a children's story about a mad scientist, can be adequately handled by **script- or schema-driven planning**. That is, the writer can call up a richly instantiated schema for the task complete with detailed prototypes for mad scientists (cf. Rosch,1975), conventional frames for narrative or argumentative discourse (Bracewell, Frederiksen, & Frederiksen, 1982; Witte & Cherry, 1986) and a script which suggests appropriate plans and goals (Schank & Ableson,1977). Under the most efficient conditions, the available options for structuring such a story would also be limited, and planning would look much like a selection process, guided by the schema's plan. The writer could concentrate on filling in the slots with appropriate information, because the script has already done much of the planner's work, providing time-tested goals, tests, prototypes and plans.

2. Other writing tasks can be handled by another planning strategy which also minimizes constructive effort. **Knowledge-driven planning** allows writers to perform an efficient memory dump. Asked to write a research bulletin on a familiar topic, a writer could simply construct an associative chain and produce a text that reflected the richly integrated structure of his own knowledge. It is clear that knowledge-telling as a planning and production strategy *can* produce quite sophisticated, well-organized texts.

However, this planning strategy often fails for two reasons: One is that the writer's knowledge is not itself well-organized, adequately conceptualized, or fully integrated. The contents of memory may be merely associative with little hierarchical structure. As Langer (1984) has shown, this becomes a visible problem for writers as early as ninth grade. Students whose topic knowledge was associatively structured could write effective papers as long as the assignment was an open call for information. However, when the task called for writing which answered a question or focused on an issue, their writing failed. To return to our earlier examples then, when the knowledge-driven planning strategy operates on an unstructured knowledge base, the result is likely to be a locally organized, but rambling report or an unfocused bulletin.

Knowledge driven-planning can also fail when the writer's knowledge is impeccably structured but inappropriate for the task. If, for example, the research bulletin was supposed to function as a set of research-based *guidelines* to be read by non-specialists, then the researcher's topic knowledge would have to be reorganized as a set of implications, procedures, and cautions--a knowledge structure he perhaps didn't possess until the writing task called for it. In fact,

instructional texts of this sort often fail because the structure of expert topic knowledge--which apparently guided planning and writing--was the wrong structure for the reader (Kern, et al. , 1976).

Scardamalia and Bereiter (1987) have proposed a model of knowledge-telling in young writers which operates with a very simple "what next" process of retrieving related topic information, filtering it through genre constraints and writing it down. This limited yet very generative process lets youngsters write school essays without resorting to planning, goal-directed knowledge search, or reorganization. The related knowledge-driven planning we observe in adults differs in important ways. Our term refers to a planning strategy (not the entire composing process) which operates at the executive level, orchestrating other parts of the process. And it involves genuine, complex planning; that is, writers set goals related to content and they actively search for and manipulate their topic knowledge before writing. However, as with children, when this executive level strategy is in control, the planning process is dominated by the *goal of telling knowledge*.

For example, in tracing the process of a writing group in a graduate program in public policy, we observed this strategy dominating their writing process even as it was failing to meet the explicit demands of the assignment and of an instructor. The group was asked to evaluate current F.A.A. guidelines for dealing with wind shear and then to recommend policy guidelines which would help minimize air crashes caused by this dangerous phenomenon. This task clearly embodied multiple purposes including the *rhetorical purpose* of proposing new guidelines in a climate of deregulation. Because it had to speak to a mixed readership of technical experts and policy makers, it required the writers to adapt rather complex technical information, such as details about advanced radar systems, to the needs of the audience. However, the final report was dominated by technical description--even though only one member of the group was expert in the area, and despite the criticism and urging the group received on drafts. They failed to move from knowledge-telling and failed even to address the assignment's request for evaluation and guidelines. In this situation, the writers depended on a strategy driven by knowledge-telling even when the task called for a process we shall discuss as constructive planning.

3. Although all planning is constructive in a broad sense, a third kind of writing task, on which this research is focused, calls for a strategy we will call **constructive planning**. Knowledge-telling and schema-filling strategies--as powerful as they are--are inadequate for tasks that require adaptive use of knowledge or for tasks which are more complex than available scripts and schemas. A constructive strategy involves setting one's own goals, criteria, plans, and procedures in response to the task. It can operate at the executive level, shaping the entire plan, or be called on to carry out (or bail out) a schema- or knowledge-driven plan.

In practice, of course, most writing tasks call for the well-timed integration of all three planning strategies. But when do writers switch and why? We can begin to map the logic of this integration by asking: What would it take for each approach to succeed on its own as an executive level planning strategy?

Executive Level Planning Strategies and The Conditions for Success

When the three planning strategies described here operate at the executive level of the writing process, they provide an overall framework for planning. That is, they 1) guide goal setting, testing, and the search for knowledge, they 2) govern how processes are nested within one another, and they 3) guide the use of more local strategies for planning and composing. Because each strategy has its costs and benefits, writers may switch executive strategies during composing. If, for instance, a writer finds that her schema for writing guidelines is too elementary or underspecified to provide a workable plan, she may switch to the more demanding (but chancey) process of constructing her own goals, criteria, and plan. These planning strategies may also be nested within one another. In the act of constructing a plan, a writer sets a sub-goal: use a personal anecdote. To plan the

anecdote the writer turns momentarily to a schema-driven strategy (based on her knowledge of the conventions for anecdotes) . The schema-driven episode has been nested within a process guided at the executive level by a constructive strategy, just as the anecdote itself will be nested within the content structure of the text.

The value of a given strategy, we want to emphasize, is its strategic value, based on how well and how efficiently it does the job at hand. Why reinvent the plan for writing haiku when the tradition of the genre can supply a lavish schema? Likewise, technical writing furnishes clear cases in which topic knowledge and text schemas constantly interact with more rhetorical decision making. However, in order to spotlight the conditions which move writers into constructive planning, we have focused on the requirements of what we are calling a complex expository task, which includes academic papers and professional reports. This limitation allows us to sketch some of the conditions that are necessary for these three planning strategies to succeed and to predict some of the typical outcomes that occur when one fails. In a typical task of the sort we study:

- The problem is ill-defined, so many of the goals for the task are generated by the problem-solver and many must be determined over the course of planning and even execution.
- The set of goals and constraints to consider (the rhetorical problem space) may be quite large.
- There is a substantial body of topic information to manipulate.
- Much of that information is not already conceptually organized to meet this particular rhetorical problem or the needs of this audience.
- The act of planning usually alternates with the construction of an external product (i.e., the text produced so far) which can in turn change (even radically change) the problem space in which the writer is working.

Under these situations we can specify some of the conditions for the successful use of each strategy and see why writers may be pushed to constructive planning despite its cost.

STRATEGY	SOME CONDITIONS FOR SUCCESS

Schema-driven

1. *The writer knows a script or schema appropriate to the task.* At least two important "ifs" are built into this condition. The writer's assumption that the task fits an available schema must be correct. A conventional representation of an unconventional problem trades convenience for success. Secondly, when a complex production schema is required, to "know" it may require some years of practice. For instance, people recognize many text conventions they can't produce.

2. *The schema is specified in adequate detail to guide the drafting of text.* It is not too abstract or incomplete. For example, if a given writer's schema for "a good argument", is too vague to be operational, she may need to turn to constructive planning to solve the problem.

Knowledge-driven

1. *The writer has the necessary topic knowledge.* If so, his attention can turn to searching knowledge (or sources) and to expressing that information accurately, eloquently etc.

2. *The structure of the writer's knowledge fits the task.* That is, the current conceptual structure, logical links, hierarchy and/or focus of the writer's knowledge offer a good fit to the writer's purpose, the needs of the reader, or the issue in question. If not, a re-constructive planning process may be required.

Constructive

1. In place of invoking a script or schema, *the writer must build his own initial representation of the task and hope to specify those critical elements of the situation which will affect success*. This initial representation sets the goals which guide planning. As a more constructive effort than we see in the other strategies, it leads writers to explore the task and generate information not only about the topic but about the theme or purpose of the text, its form, the audience, and other task-specific goals. This initial task representation typically provides a global but still very abstract set of goals.

2. *Based on the initial task representation, the writer must be able to generate a body of supporting goals, sub-goals and plans to solve the problem.* That is, the writer must construct much of the information that in schema-driven planning is supplied by the schema. The ill-defined nature of even ordinary writing problems like a letter of recommendation can leave a planner with many options and little guidance. Even when topic knowledge and discourse conventions play a major role by suggesting subgoals and text plans, the task often calls for a goal-directed selection of the right schema and adaptation of even conventional knowledge.

3. *The writer must integrate these goals and plans.* In constructive planning writers often produce an expanding body of plans and goals and subgoals which they must then integrate or run the risk of fragmentation and substantial conflicts. Expert writers exhibit a number of strategies for consolidating and integrating their plans. One way to do this is, of course, through top-down planning, in which goals lead to subgoals. However, if the writer is operating opportunistically (i.e., planning in response to opportunities as they present themselves), the result is often a body of separate, locally generated plans, which the writer must then consolidate after the fact into a larger hierarchical plan. This condition for success--a fully integrated plan--is one which even experts often fail to meet in first drafts.

4. *The writer must be able to instantiate abstract, global goals with a workable plan and with appropriate discourse conventions.* One advantage of constructive planning is being able to operate with abstract or broad rhetorical goals. But because these allow many possible instantiations, writers must translate such goals into operational subgoals, into local text plans, and into actual text. This process of instantiation may also require knowing particular discourse conventions, such as knowing the different conventions for writing an introduction or building a case which are appropriate in psychology, in English, or in education. In addition, the writer must be able to work with a nested set of goals and to manage plans embedded within plans (e.g., using an anecdote to introduce a housing problem, in order to build a case for a claim that solves the problem). The common difficulty here is keeping track of top-level goals and not letting concrete information or a more immediate plan (e.g., the anecdote) take control of the text.

5. *The writer must resolve conflicts.* Because constructive planning tolerates added complexity and deals in abstract plans, the probability of conflicting plans and goals is high.

Given these conditions for success with these three executive planning strategies, we can also specify three common outcomes which occur when these conditions are not met.

Outcome 1: Writers produce a novice performance.
Some of the common patterns of novice performance in writing reflect predictable difficulties in meeting these conditions. For example, novice writers often have incomplete knowledge of the

scripts for different kinds of discourse. In writing an introduction to a research report for example, they may be fully aware of the formal features (e.g., include lots of references) but not the underlying function (e.g., use a review of the literature to frame an issue or to establish one's credibility). As a result, their attempt to use a script-filling strategy produces a typical novice performance--long on citations and short on point. Our study of the technical writer's effort to turn technical information on wind shear into a policy statement is a good example of failing to meet a condition of successful knowledge-telling. The writers had appropriate knowledge, but the structure of that knowledge failed to meet the task.

Outcome 2: Writers switch executive strategies.
When a knowledge- or schema-driven strategy fails to fit the situation, an alternative to "novice performance" is to switch to the active problem-solving of constructive planning. Likewise, when the conditions are met for knowledge-telling or script-filling during planning, writers will switch to these more expeditious strategies or invoke them under the guidance of a constructed plan. However, the novices we observed rarely switched to the active goal setting, testing, and integrating of constructive planning even in the face of considerable frustration with their current effort.

Outcome 3: Writers draft and revise.
One of the peculiarities of writing is that it is often efficient to produce a draft with the knowledge that it will not succeed and to use a second pass or revision to produce a text that meets the conditions. For example, the writer may use the first draft as a knowledge dump with the intention of reorganizing or adapting it as a second step. The fact that experienced writers often rely on such an apparently inefficient method may suggest that it is difficult to partition the writing task in a simple, linear fashion into planning, writing, and polishing, even though this approach has been advocated by traditional textbooks.

Planning in expository writing, we have tried to suggest, is a strategic process that depends on three major planning strategies, schema-driven, knowledge-driven and constructive planning. Each of these has unique advantages for the writer and its own demanding conditions for success. This theoretical perspective, with its emphasis on the strategic nature of planning, lets us predict difficulties writers often encounter and, we suggest, it points to a major cause of poor writing. Students and professionals often produce "correct" but ineffective texts when they rely on scripts, schemas, and topic knowledge in a rhetorical situation that calls for more adaptive, constructive planning. So before turning to a cognitive analysis of this constructive strategy, we would like to examine it in the context of instructional and academic writing, where it may play a far larger role than has been assumed.

Planning Instructional Texts: A Case in Point

For many years, the task of creating instructional texts to help readers perform a task was viewed as a relatively simple and straightforward process of gathering the relevant facts or procedures on a topic, creating an outline, filling-in the outline with the relevant content, and then editing for grammar and spelling mistakes (Kern, Sticht, Welty, & Hauke, 1977; Anderson, Brockmann, & Miller, 1983; Duffy & Waller, 1985; Odell & Goswami, 1982; Schriver et al., 1986). Writing in non-academic contexts has been commonly regarded as "a pragmatic routine of transferring and archiving information--the afterthought of serious research activity" (Paradis, Dobrin, & Miller, 1985; p. 281). While conceiving of writing in this manner can make for an efficient and streamlined process, it can also lead to a product that fails to *communicate* "the relevant facts or procedures" for the intended audience. Instead, texts produced in this way tend to merely *transmit* information, forcing even well-educated readers to spend considerable cognitive effort to comprehend the text. In many cases, the effort spent attempting to decode such texts is not justified because the information wanted by the reader is missing entirely (Bond, 1985).

In 1977, Kern, Sticht, Welty, and Hauke demonstrated just how problematic such texts can be for new recruits in the military--readers who typically do not have the reading comprehension skills to unravel text that is written "as a body of knowledge" similar to an encyclopedia entry. Kern et al. (1977) characterize two ways to orient instructional texts: "topic-oriented" and "performance-oriented."

Topic-oriented writing focuses on the generalizations and concepts which constitute a body of knowledge--it tells "about" a subject area rather than telling "what to do" or "how to do it." Topic-oriented texts are not oriented to a particular audience; they do not present particular tasks for the user. Instead, they require the reader to deduce from the description what tasks are to be completed. Moreover, topic-oriented writing places heavy demands on the reading, studying, and conceptualizing skills of the user.

Performance-oriented writing, on the other hand, focuses on the duties and tasks a user is expected to perform and the information needed in order to perform these duties and tasks--it tells the user "what to do" and "how to do it." In performance-oriented writing, *information is selected* from the "body of knowledge" and organized to to place emphasis upon its application to duty and task performance. Performance-oriented writing identifies a particular user audience.

To write performance-oriented texts, one starts by identifying who the major user will be and the tasks and duties the user will need to perform. The writer then translates the knowledge of the subject area into the information and directions the user will need to learn and perform the duties and tasks identified by the writer. As a result, performance-oriented writing has greater relevance to users of instructional texts than does topic-oriented writing. The reader does not have to strain the information he or she needs out of a encyclopedic-like entry and then figure out what to do with the information. Moreover, performance oriented-writing minimizes demands on the reading, studying, and conceptualizing skills of the users.

Kern et al. argue that while the objective of most military training is to teach people to perform specific tasks, most of the training materials at the time of their study were topic-oriented, that is, telling the reader about the subject area, describing its concepts and generalizations, rather than telling "what to do." Kern and his colleagues were among the first advocates for readers of such instructional texts (i.e., texts aimed at helping readers perform a task rather than to learn about a topic), asserting that readers of performance-oriented texts should not have to figure out for themselves how the information presented relates to the job they are to perform.

Since Kern et al. brought the problem of poorly written instructional texts to public attention over ten years ago, there has been considerable progress into investigating how to produce texts that are comprehensible and usable. The Department of Defense, for example, has developed rules, guidelines, task analysis procedures, validation and verification procedures, and a host of specific user- or task-oriented organizations and formats in a continuing effort to improve the usability of manuals (Duffy, Post, & Smith, 1987). See, for example, the work in this area conducted by Hatterick and Price, (1981); Duffy, (1985); Smillie (1985); Kern (1985). Despite the proliferation of new research in instructional writing, actual practice in creating texts that draw on the growing body of research is lagging far behind. Duffy, Post, and Smith (1987) have pointed out that only those texts that are prepared as part of a research effort seem to be developed out of current knowledge.

Unfortunately, the problem of bad instructional writing is so widespread that most consumers have had negative experiences with trying to use products and being unable to understand the instructions. A case in point is the Adam computer manufactured by the Coleco Corporation in the early 1980's. Coleco's "Adam" was advertised as being so simple to understand that even a five year old could operate it. But when the time came for parents to help their child "get started," adults could not understand the documentation that accompanied the machine. It turned

out that adults failed in their attempts to use the machine, not because the hardware was poorly designed, but because the documentation was written from the point of view of a programmer rather than a new user. Adam lost Coleco millions of dollars and had to be withdrawn from their product line, with headlines in the *Wall Street Journal* that read "hundreds of Coleco's Adams are Returned as Defective; Firm Blames User Manuals" (Nov. 30, 1983). Research in writing has yet to make a significant impact on how instructional texts are planned, written, and evaluated.

A closer look at how instructional texts are often produced in institutional, governmental, and corporate contexts provides insight into why progress has been so slow. In addition, examining some of the pragmatic constraints that shape the writing of instructional texts can show us why so many texts produced across many types of industries and government contexts usually fail for the intended reader. Moreover, looking at how problematic texts are produced can suggest how social context shapes the planning process.

Redish, Battison, and Gold (1985) suggest that even when writers want to produce a document that is easily understood by readers, they may have difficulty in doing so. Their research of companies and government agencies demonstrates that four major constraints operate against producing instructional manuals that draw on new knowledge and research:

1) *Company standards require traditional styles.*
Many companies and government agencies (particularly the military) have specifications for their manuals that are based on traditional formats. The specifications often focus on technical accuracy to the exclusion of accessibility and comprehensibility. In many cases (the military, for example) comprehensibility is measured by a readability score, although a readability formula will not measure any of the organizational factors that promote accessibility.

2) *Writers aren't given the time to do the job well.*
Few managers or technical staff appreciate the time it takes to write a useful manual. Once the computer program is written, everyone is anxious to get it on the market. Even though the program will be judged in part on its manual, and even though users will not even be able to understand or use all the features of the program if the manual is poorly organized, everyone wants the manual to be written yesterday and printed tomorrow.

3) *The computer program or company policy changes as the manual is being written.*
Writers must remain flexible and willing to change the organization of the manual as changes occur.

4) *Writers do not have adequate training.*
Expertise is a major constraint on creating successful instructional texts. The task is often assigned to a technical expert (computer programmer or policy analyst) who has little, if any, training in writing.

Clearly, these constraints shape much of the planning writers do when designing instructional texts. Most researchers of instructional texts would agree that the most pervasive of these problems are those associated with writing to specifications (constraint #1) and those that result from texts produced by subject-matter experts (constraint #4).

First, the primary problem associated with writing to specifications is that it tends to promote formulaic or script-driven planning. In a recent article, Duffy, Post, and Smith (1987) interviewed a range of personnel at government publication houses of instructional texts to determine what aspects of the manual writing process were problematic and in need of revision. They found that each of the publications houses they studied used the text, *MIL-M-38784 Military Specification, Manuals, Technical: General Style and Format Requirements*. This text is an 80 page document, consisting of about half text and half illustrations, giving examples of format requirements and

pointers to other specifications in related documents. The specification manual describes what kind of information must be included in the manual, how information should be formatted, how text and illustrations should be integrated, and what readability level manuals must meet. The Navy, for example, requires that no manual exceed a ninth-grade level. This specification translates into producing texts with an average sentence length of 20 words, an average word length of 1.6 syllables, and less than 15 percent personal sentences (i.e., sentences with personal pronouns).

The interviews with the writers of military technical manuals unearthed major complaints about the specifications: 1) the specifications were indiscriminately applied to all types of technology; 2) no interpretations of the specifications were provided; 3) there were no specifications appropriate to writing documentation for some of the newer technologies. When writers were asked about the kind of information they used to guide their writing, their responses suggested that they did little if any high-level problem solving or constructive planning, e.g., establishing content-specific, unique goals and criteria for the text. Rather, they seemed to view their job as copying the style and format of the production house's most current technical manual that met specification. Duffy, Post, and Smith assert that the specification appears to be the sole focus in the writing and formatting of the document. Writers indicated that they attended to issues such as ease of comprehension or other audience issues *only* when they were required in the specification. Thus if a specification required that the text meet a particular readability standard and that the passive voice not be used, then writers would meet those specification requirements. Otherwise, audience considerations did not appear to enter into the planning process. Moreover, considerations such as readability level and voice call for planning only at the sentence level. It appears that even when such writers believe they are doing their best planning for the audience, the level at which they are operating prevents them from making changes that may have the most effect on the audience, e.g., organization, selection of content, logic, and appropriate level of information.

Similarly, in other contexts that produce instructional texts for readers with a particular task to complete (e.g., computer manufacturers in the U.S. and in Japan), planning for the audience takes a backseat to planning content and format (Schriver et al., 1986). Many companies seem most concerned with developing specifications so narrowly defined that their implementation can be checked by a computer. Such a focus has lead to company specifications which take the form of *allowable* word lists, number of paragraphs per page, number of cross-references per page, number of index entries per word, number of headings per page, and other countable measures.

We can see then, that writing to specifications can severely constrain and even subvert the problem-solving process--so much so that the specs operate as barriers to planning texts that meet readers' needs. The more content and format constraints that are placed on the planning process, the narrower the solution space becomes--planning in such cases becomes meeting the prescribed formula. In an effort to produce consistency between and across texts, specifications are aimed at reducing the number of options provided to the writer.

Unfortunately, in many cases, making the writer's task simpler comes at huge cost for the reader. Specifications give writers a phony sense of security that once the "spec" is met, the text is ready for a reader. Specifications can have a pernicious effect on the planning process, allowing writers to think they did a quality job when in fact, they have failed for the reader (Duffy, Post, & Smith, 1987). Text generated by a myopic script-driven planning process may pass a formulaic measure of readability at the sentence level but baffle the reader at the whole-text level that matters most. That is, to comprehend ideas, learn new concepts, and perceive the structure of those ideas, readers need an integrated representation at the level of the entire text. Despite the problems associated with writing to specifications, the "specs" themselves are not the root of the problem. The problem is that writers fail to view the "specs" as subgoals within a larger framework of unique goals for the audience, the text, and the client. Instead of using specifications to help supplement the planning process, they are almost always used to drive the planning process. This narrow

focus constrains writers' process in a way that allows them to cling to their formula-- counting the number of words they used in a given sentence--while blindly ignoring important whole-text issues such as comprehensibility, usability, and accessibility.

The second major problem with the production of instructional texts lies in the expertise of the writer. In many contexts, the people who write instructional texts are subject-matter experts (such as engineers or computer scientists), not people trained in writing. Such experts, while extremely knowledgeable about the particular domain about which they are asked to write, are frequently unable to communicate that knowledge to the intended audience of the manual--especially when the audience is comprised of people without subject matter expertise (Swaney, Janik, Bond, & Hayes, 1981; Schriver et al., 1986; Hayes, Schriver, Blaustein, & Spilka, 1986). Subject matter experts tend to assume that what is familiar to them will be familiar to all people and often report technical information in the same structure as they know it, using the same language. Such a writing process may produce text that is comprehensible to experts, but may fail with a mixed or novice audience.

In Figure 1a, we present a "before" portion of a computer manual that was intended to be used by novice users; in particular, it is aimed at secretaries of a computer science research lab. It is very easy to detect that the writer is a computer scientist. In this example, the writer was the developer of a new text-editing system called "Oil." Notice how he organizes the introduction of his manual around the facts as he knows them. He first distinguishes "Oil" from other editors, despite the fact that his readers will have no knowledge of these other editors. His second choice of information is focused on explaining the development of the software. The writer selects the facts according to his personal opinion about what is important, interesting, and unique about the software. The way he presents the facts is much like a narrative, focusing on the story behind how the editor was developed. Unfortunately, while facts such as these may intrigue other developers of text editors, they have nothing to do with what readers need (and want)--hat is, how to start, operate, and stop the editor, not its history and future implementation.

The "after" of this text, a portion of which is presented in Figure 1b, shows how a writer revised the text based on reader protocol feedback from one of the secretaries at the lab (Schriver, 1984) . You will note that none of the introductory information is the same and that the writer now starts with how to invoke "Oil."

This example is intended to highlight the problem of using one's knowledge as the only goal in planning a text. Like the writers who lean on specifications to guide the planning process, very often subject-matter experts rely exclusively on their knowledge to produce instructional texts. Duffy, Post, and Smith (1987) note that most writers of instructional texts for the military are ex-military technicians or college graduates in engineering, particularly electronic or electrical engineering. They found that the mix between ex-military and engineers was estimated to be between 50/50 and 40/60. While knowing about the subject is important to writing about a technology, it falls short of the kind of rhetorical knowledge needed to adapt the subject for an audience.

The task of writing instructional texts then becomes an especially complicated task. On the one hand, the writer must know something about the technology; on the other, the text must be adapted to those less familiar with the technology. We now have growing evidence that the knowledge-telling strategy and script-driven strategies are not enough to meet the needs of readers. We can see how these two strategies dominate the production of instructional texts, largely due to historical artifact--that is, the pragmatic constraints on how texts are written and who has been writing them. We can also see that these strategies, when used in exclusion, often work against strategies for creating instructional texts that work for readers--strategies such as:

Oil: The Introduction

OIL is yet another text editor. It incorporates features of many previous editors, but is not quite like any of them. The goals of the OIL editor are:

- To fit into the Spice environment. In particular to access the screen through Canvas [Ball 81] and to take advantage of the large virtual storage provided by Accent [Rashid 80].

- To be available quickly, at least in skeletal form. In order for program development under Accent to be possible there must be *some* editor availble. The first version of OIL is not meant to be the last word in editors, but was designed to be quickly implementable.

- To be smoothly expandable. The first version of OIL is not the last. Features which are not yet implemented, but which are anticipated include programmability as in Emacs [Gosling 81] interface to MultiScript [Multi 81] and (possibly) multiple character fonts.

13

This document concentrates on describing the editor as it is now, but there is a section near the end on future plans.

The Basics

OIL is a modeless editor. This means that pressing the same key will always cause the same efeect. This statement has to be interpreted somewhat liberally. The ctrl-x key serves as an escape, and changes the meaning of the next key pressed. The ctrl-x and the following key must be interpreted as a single compound stroke.

Figure 1a. A Portion of a Computer Manual Written by a Computer Scientist: The "Before"

Oil: The Spice Editor

2.1 Introduction

This chapter is about Oil, the editor that runs on Accent. Many of the Oil commands described in this chapter are similar to EMACS editing commands. Like Pepper (the editor that runs on POS), Oil allows you to position the cursor in two ways: with the pointing device or with the usual keyboard commands. One advantage of using Oil is that it allows you to take advantage of the large storage space provided by Accent.

2.2 The Basics

Read this section through before you use Oil. Then follow the instructions in Exercise 1 on the next page.

2.2.1 Invoking Oil

To create or edit a file *edit <filename>* RETURN

You may abbreviate the edit command by typing *ed.* If you are creating a new file, you will need to hit RETURN a second time in order to use Oil.

After you type the filename and hit RETURN, Oil gives you a chance to edit the filename. You edit filenames using the same commands that you would use to edit text, except that you cannot use commands that move the cursor between lines of text.

If you do not specify an extension to your file name, Oil will add one for you (such as .pas, .pasmac, .mss, .cmd, or .micro).

Figure 1b. A Portion of a Computer Manual Written by a Professional Writer: The "After"

1) defining the audience's knowledge, background, reading ability, reading strategy, reading goals (e.g., reading to do, to learn, to remember, to access), and probable uses for the text;

2) selecting relevant information from a large body of topic-knowledge that will fit the audience's needs;

3) translating the selected information into language that can be understood by the intended audience;

4) organizing the information so that it places emphasis on the reader's needs, such as "what to do" and "how to do it";

5) anticipating the reader's difficulties and writing to help minimize demands on comprehension and performance.

In the face of more complicated technology, and with a greater distance between the knowledge of the creator and user of the technology, it is essential that writers produce texts that readers can understand, access, and remember. Clearly, writers of instructional texts need to rely more on constructive planning, which calls on the skills of creating, managing, and instantiating goals for the audience, subject-matter, and format.

Academic Writing : A Second Case in Point

Academic writing is by definition devoted to the careful transmission of knowledge according to the discourse conventions (the scripts and schemas) of various academic traditions. However, academic writing tasks which also require constructive planning immediately stand out. In fact, children's developmental growth and success in school writing are often measured by the ability to transform rather than rehearse knowledge and to adapt it to a rhetorical problem. In responding to exams or essay questions, students who practice knowledge-telling on a loosely structured knowledge base fail to answer the question (Langer, 1984). Constructive planning, by contrast, is one way writers transform their knowledge on demand. In an attempt to teach reflective thinking in writing, Scardamalia, Bereiter and Steinbach (1984) defined reflectivity in terms of such text features as: content tied to the point of the essay (not just the topic), focus on a central point, creating a distinctive viewpoint, and attempting to communicate why the topic was interesting to the reader. They found that instruction in planning not only produced an increase in reflective processes during planning, but an increase in the text features mentioned above.

Constructive planning also seems to play a role in reading-to-write tasks that might conceivably be handled by knowledge-driven planning. Spivey's (1983) study of discourse synthesis asked students to read and integrate multiple source texts (encyclopedia articles on armadillos) for an audience of 12th graders. She found that the syntheses produced by good readers were significantly more integrated--there were fewer thematic chunks and each was more fully developed--and that these features also predicted the holistic quality of the texts. Similarly, when Kantz (1987) asked college students to synthesize seven dissimilar texts on creativity into written advice to particular readers, the highly rated papers were distinguished by their blend of original and source text ideas and by the writer's rhetorical stance. Writers of the low rated papers took the stance of a Summarizer, a Paraphraser and Commenter, or a (complete) Independent, with regard to the source material. The higher rated writers chose to operate as either Explainers or as Builders, who created original statements by using but transforming the source texts.

These studies suggest that certain important academic tasks, such as writing a reflective essay or a synthesis, not only require the accurate telling of knowledge and adept use of discourse conventions, but also demand adaptive, goal-directed cognition and the transformation of knowledge. Even when a well-defined script is available, as it often is for reporting technical information, there are many ways to fill the slots of such scripts, and writers may resort to constructive planning within a script-driven process.

III. CRITICAL FEATURES OF CONSTRUCTIVE PLANNING IN WRITING

Planning in writing, we have proposed, is a strategic process that draws on three powerful strategies: schema-driven, knowledge-driven and constructive planning. Because of the importance this latter strategy has in ill-defined problems (and the frequency of such problems in adult writing), we will devote the rest of this paper to developing a preliminary theory of this constructive process. Drawing on exploratory analyses of the planning we have observed in expert and novice writers, this discussion offers a richly specified, data-based hypothesis which can guide the more sharply focused observational and experimental studies to follow. It will present five critical features of constructive planning that appear to contribute both to its difficulty and success.

The data used in the detailed parts of this analysis comes from nine subjects including three expert writers (English teachers selected for an NEH Fellowship in rhetorical studies, who teach and write in the field); three student writers who were motivated enough the seek some assistance at the university's Writing Skills Center; and three student writers we will label as "problem" writers who were identified by teachers as poor though not unwilling writers and who did indeed produce problematic or inferior texts. This discussion involves a re-analysis of some data presented in an earlier paper that proposed a more general model for the writing process (Flower & Hayes, 1981). This project lets us carry that initial work to a sharper conclusion, by creating a more specified and testable description of planning within that original sample of discourse.

Subjects were asked to take approximately an hour to work and were asked to think aloud as they planned and wrote an essay on their job for a readership specified as the "young, female audience" of *Seventeen* magazine. The task was designed to reduce the effect of differences in topic knowledge across these subjects and to call for constructive adaptation of knowledge to a new rhetorical problem. And in fact most writers, including the experts, spent some time pondering just what "my job" should mean in this context, testing their knowledge against the needs of that audience. On the other hand, with only an hour to work, this task also called for efficient and focused planning.

Five Critical Features

Let us place this process and our claims in context. The five planning maneuvers noted below (i.e., building an initial task representation, etc.) are not unique to writing. Writing draws on many of the same generic processes used to solve ill-defined problems in other domains. (Cf. for instance, work on ill-defined problems, Reitman, 1964; Simon,1973; on design, Ballay et al., 1984; on abstraction spaces, Sacerdoti, 1974; on conflicts, Wilensky, 1981.) However, our research suggests that, in writing, these particular processes are the critical ones. One might ask, for instance, why a process such as initial task representation or integrating goals is critical in writing while it may be trivial in another planning task, such as errand planning (cf. Hayes-Roth & Hayes-Roth, 1979)? Success in handling these five features appears to be a condition for success in writing, and each is the site of some important expert and novice differences.

Secondly, we need a well-specified theory of how writers actually carry out or instantiate these generic processes. Understanding the process by which writers represent a problem, integrate plans, or resolve conflicts not only helps distinguish writing from other tasks, it also helps us see how the constructive strategy differs from other planning strategies. Constructive planning, as a theoretical construct, lets us distinguish between *constructing a plan* of one's own (even though that plan uses convention and embeds other sorts of planning in its service) and *drawing on the plans provided* by topic knowledge or a well-defined script or schema. If we ask the question, "Who/what is doing the work of making the plan?" these three strategies give us significantly different answers. However, the strategy we have styled constructive could simply be another name for doing "more problem solving." And in one sense this is true. Complex tasks usually call for more effort. On the other hand, writers might put great effort into planning an accurate organization of topic information or into implementing some feature of a conventional writing plan

(e.g., trying to design a concise but inclusive literature review), yet all this problem solving would not be in the service of constructing a new plan.

The five critical features of constructive planning we will discuss are:

1. Building an Initial Task Representation
2. Generating a Network of Working Goals
3. Integrating Plans, Goals, and Knowledge
   Strategy 1: Exploratory Planning and Multiply-Linked Goals
   Strategy 2: Creating Subgoals
   Strategy 3: Monitoring Progress on Goals
   Strategy 4: Creating Goal Families
   Strategy 5: Intention Setting
   Strategy 6: Consolidation
4. Instantiating Abstract Goals
   Strategy 7: Using Code Words as Pointers
   Strategy 8: Creating How-to Elaborations
5. Resolving Conflicts

Whether this family of strategic processes we have defined as constructive planning constitutes a necessary or exclusive set is an empirical question this study can't answer. The five key features we have observed are linked in that they are ways writers create a new plan and deal with the problems of integrating goals and resolving conflict that such construction engenders. The fact that experts and novices differ on their ability to control these constructive moves suggests that we are seeing five critical features of a strategy that develops with experience. Although further research may change our way of characterizing this strategy, one test of constructive planning as a construct will be its power to explain at least three impressive feats: how writers manage ill-defined problems and the social context of writing, how they transform their knowledge through writing and how they integrate topic knowledge and discourse schemas into their own process of strategic planning and goal-setting.

1. Building an Initial Task Representation

Representing the task at hand to oneself is a necessary part of all planning. In many tasks, such as doing word problems in math, solving puzzles, or even playing chess the trick is often to ***recognize*** which of a set of standard problems or patterns you are facing. Once the expert physicist (Larkin, 1983) represents a new task as a "force" problem, it is, so to speak, all downhill after that. Pattern recognition plays an important part in writing as well, especially in planning highly conventionalized features of a text, such as the methods and materials section of a technical report. Schema- and knowledge-driven planning depend on the early recognition of a familiar problem to pare down this initial representation process.

However, an ill-defined writing problem can force people to build a great deal of this representation for themselves (if, of course, they choose to see the task as an ill-defined one, requiring an adaptive plan). When writers undertake to re-organize their knowledge to fit an audience and a rhetorical purpose (e.g., to write wind shear policy guidelines), the process of defining the task looks less like recognition and more like construction. In constructive planning, building this representation can be an extended and inventive process. In the professional contexts described in Section II, it might involve interpreting job specs for a new manual in light of costs and deadlines, as well as collaboration with supervisors, technical experts, and production staff. In an academic context, it might involve "reading" an assignment in light of the goals of a course, the perceived intentions of an instructor, and talk with a roommate, all of which interacts with one's prior assumptions about college writing and the skills and strategies one currently controls (Flower, et al., in press). For the nine writers in this analysis, the task itself was open-ended, but it occurred within a familiar academic context that foregrounded one's performance as a writer and

within the tradition of essay writing that privileges goals such as being "interesting" and "informative." The question is, how will different writers negotiate these multiple messages, opportunities, and constraints?

Building a complex and unique initial representation is not only a distinctive feature of constructive planning, it appears to be closely tied to the writer's success. In asking people to write about their job for a specialized audience, we hoped to create a task for which all writers could have ample personal knowledge about the topic, but would probably *not* have that knowledge already organized for the purpose or readership we proposed. In contrast to problem-solvers on other complex tasks, such as errand planning (Hayes-Roth, Hayes-Roth, 1979), writers on this task were expected to do what professionals writing to lay audiences often have to do, which included the following:

- Writers had to determine their own global goals. (E.g., What should I try to accomplish in such an essay? In deciding this question our subjects considered goals ranging from: I could talk about the part of my job I'm interested in, such as this new steam turbine I'm studying; I think I'm going to give them some practical tips on being a waitress; I want this essay to raise the horizons of these girls and help them take a critical look at their own future.) Writers on this task gave themselves radically different problems to solve.

- Writers had to represent the audience to themselves (E.g., Am I writing to people like myself, to people like I was, but adjusted for 20 years, to consumers of fashion, to girls who, as one 19 year-old male put it, probably want to "do something retarded like being a model," and so on.) Many writers actively struggled with alternative views of the real or imagined reader.

- Writers had to decide what knowledge was relevant, given their goals. For many writers even the question "just what is my job?" was interestingly problematic. The answer depended in part on their image of the audience and the goals set for the essay. And that decision in turn appeared to depend partly on what information would be easy to access.

Because writers can spend so much time representing (and re-representing) their task and because they end up with such diverse images from a common assignment, task representation clearly influences the kind of text people write. In a follow-up study (Carey et al., 1989), we also found the quality of the final text was strongly correlated with certain features of this ***initial*** task representation. We defined an *initial* representation as an effort to explore the whole rhetorical problem, which we categorized into five key dimensions--aspects of the problem to which writers regularly attend or for which they create goals. These five dimensions--"topic," "theme or purpose," "form," "audience," and "other task-specific goals"--were used to analyze the goals our writers created during the period of *initial* representation. ("Initial" was defined as all the planning which occurred before writing began.) In this sample all the writers whose texts had been judged as "effective" texts gave some attention to *each* of these key dimensions. The less successful writers, however, left many aspects of the problem unnoticed (the "theme or purpose" dimension was particularly neglected).

In addition, we found that scores for text quality were strongly correlated with both the *amount* of initial planning (extensive initial planners did better) and the *quality* of that planning (scored by judges who read the initial protocol segments). Interestingly, some texts by novice writers were judged to be more effective for this teenage audience than were some by experts, and extensive initial planning was a better predictor of this quality than the expert/novice status of the writer. The apparent importance of these *initial* representations is surprising, since writers often re-represent tasks as they work and have many opportunities to improve on their first vision of the task. We even expect such flexibility from experts. The significance of this study probably lies in

what it tells us about novice writers, whose limited initial representations and failure to take to a more constructive stance to the task may be putting an early ceiling on what they are able to achieve.

2. Generating a Network of Working Goals

Writers, especially expert writers, spend a good deal of time planning and this process goes on at intervals throughout writing and revision, even though for short (e.g., one hour) tasks much of this work is sensibly clustered at the beginning. The top-level goals we see in the initial task representation may not specify enough to manage a complex task. Writers build a supporting structure we will describe as the writer's **working goals**, which, in constructive planning, can become a complex structure quite distinct from the text. As writers search, plan, evaluate, and compose, they continue to add new information to this goal structure, which serves as a body of instructions for generating content and language and as a body of criteria for testing them.

The problem, of course, is how to structure this growing body of information in a useful way. As the repository of all the plans, goals, rules, criteria, clever approaches, taboos and so on that the writer generates or remembers during the process of writing, some of these working goals must be remembered and used at many points during writing. For instance a general goal, such as "keep this focused on their experience," has to exert a continued influence on production and evaluation, whereas a sentence-level goal can be efficiently generated, acted on and forgotten in an instant. Therefore, understanding what sort of information writers place in their working goals and how they structure them can help explain how writers manage the wealth of information they create.

There are a number of possible representations one could consider. One could visualize a writer's working goals, in their most simple form, as a *temporally* structured set of ideas, notes, plans, and mental sketches collected in a fat notebook as the writer works away. Important pages might have circles and stars; some pages with forgotten or poorly understood information would appear faint and smudged; others might have been torn out and lost altogether. Traditional composition textbooks have taken parts of this metaphor quite literally and tend to present planning as a linear process of collecting information and to equate plans with written note cards and outlines. This representation of planning treats it as an event on the page, not in the head, and as a form of text production, rather than the manipulation of ideas, goals, images, and unarticulated relations and associations, which may or may not show up in notes, text fragments, lines and arrows. Indeed the planning process of young children does seem to be consumed by this sort of "what next" content planning and notes are merely pieces of proto-text rather than abstract cues to ideas (Burtis, Bereiter, & Scardamalia, 1983). However, this linear, text-bound image of planning seems inadequate for adults.

We need a representation that can account for the recursiveness of the writing process of adults and the hierarchical structure of texts. A tree diagram of clusters of goals, subgoals,and plans lets us visualize the results of planning as an organized hierarchy . During composing, writers keep adding new nodes at all levels of this tree, giving themselves something like a looseleaf notebook that can be re-organized around changing, expanding clusters of information.

If, however, we wanted to account for the complex links and associations among such plans, it would be necessary to represent this tree as a network. In a network, each new goal (such as "Here's where I wake 'em up"; or "What this needs is a balanced yet forceful conclusion") can be seen as a response to not just one node but to half a dozen other parts of the problem. Although the basic organization can still be hierarchical, each node in the network may have multiple links hooking it to other nodes (cf. Lindsay & Norman , 1972). The representation we are proposing is this latter, essentially hierarchical network. We will represent this structure in our figures (please glance ahead at Figure 2 below) with modified tree diagrams which try to suggest, but can not adequately capture the more complex network of information that may be connected to any given goal.

Finally, and here the technology of printed text threatens to fail us altogether, we must recognize that this is a dynamic network that not only sprouts new nodes and links, but it may at some point shamelessly reconfigure itself around a new goal, a different set of criteria or priorities, or a flashy new idea. In order to trace the development of this dynamic network of working goals, then, we have represented it in the section which follows with a series of snapshots taken at the end of various planning episodes.

Before tracing the development of an individual writer's goal network, as we are able to infer it from protocol data, let us overview certain key features of these networks at a more theoretical level.

1. Working goals function as a set of instructions for what to achieve and how to do it. From the universe of possible goals, plans and criteria a writer could use, these are the ones the writer has chosen to give herself.

2. The information that constitutes a working goal takes various forms. When writers plan, they are generating both a representation of content information (or a text plan) and a representation of goals and plans which guide the creation of that text plan. We know that a writer's representation of topic knowledge can take many forms, ranging from a fully articulated argument, to an image, to a loaded key phrase operating as a pointer to memory. With similar mutability, the information that turns up on the writer's working goal network can take many forms. When such information is expressed in thinking-aloud protocols, it might be stated as a goal, subgoal, plan, criterion, or constraint. It is an easy trick of the human mind to turn goals ("I need an introduction that leads the reader to... etc.") into plans ("I'm going to start with an introduction that will lead the reader, etc."). Likewise, an idea that popped into mind as a mere constraint might in the next instant be seized upon and promoted to the role of a major goal. In understanding goal-directed processes in writing, we have assumed that the form (i.e., as a goal versus plan) in which this guiding information is expressed is not as significant as its function. The working goal network we propose here is a catholic aggregation of the information and instructions writers give themselves, which pays no attention to whether that information could be labeled a goal, subgoal, plan, etc.

3. The instructions writers give themselves have an underlying hierarchical structure enriched by multiple local connections. Some goals are global, high-level ones that affect everything below them, while others are local ones with limited influence.

4. The process of building this structure does not have to proceed in an orderly top-down or bottom-up fashion--even if the final network behind a coherent paper is hierarchical. The writer is able to extend, elaborate, or alter any part of the network at any time, even though the consequences of such change may entail a completely different conception of the text she is writing.

5. Some parts of this network will be explicit and verbal--available to consciousness as well-articulated goals. Other parts, which draw heavily on tacit or perceptual knowledge, may be hard for the planner to articulate even when asked. Naturally, our analysis will be able to capture only the pointers to such knowledge at best. However, this limitation reminds us that this theory is trying to describe active problem-solving processes in writing rather than the stored knowledge of given writers.

6. At any point in time some parts of the writer's working goals will be strongly activated, i.e., promoted to working memory rather than passively stored in long term memory (Anderson, 1980). Those attention grabbing parts of the network will be highly influential, while other goals may be quiescent or even fading away. So at any given time only a part of this structure is likely to be active in conscious attention while the rest of the structure is, so to speak, standing in the wings of working memory as an organized unit. Although no

longer in focal attention, one would predict that these quiescent working goals are still more highly activated and accessible than information merely held in long term memory. The knowledge and plans stored in long term memory are, of course, the raw materials from which new working goals can be built. But it is important to remember that whatever writers may "know," they "use" the knowledge they access; they work toward the goals they give themselves.

7. Finally, the way writers construct and manage this network of working goals should predict differences between expert and novice writers under certain conditions. In the face of a complex task, for instance, some writers give themselves a large, highly integrated network of goals; while the goals of others are limited and unconnected. Some writers reactivate or in other ways maintain contact with their top-level goals; others appear to generate and forget, shifting all their attention to their current text-level goals or text.

This view of planning in writing differs from traditional ones in its strong emphasis on goals and plans in the mind of the writer (not the text). This internal network is far more complex than the content "plan" one sees in an outline or the conventional "plans" students are taught for narrative, for a comparison/contrast paper, or for an APA-style article. To view planning in writing as the construction of a network of *working goals* (in addition to the creation of a text plan) is a significant departure from earlier images of the process which have described planning as "pre-writing," that is, as assembling and then organizing *content knowledge alone* (Rohman, 1965) or as generating exploratory drafts (Elbow, 1973). It also distinguishes planning done on complex writing tasks from that required by other other sorts of tasks, such as making moves in a simulated computer world, planning errands, or solving river crossing problems, in which the goals are either given, are relatively simple, or once established are not subject to radical reconstruction.

All writers create working goals at some level. The constructive planning strategy is an attempt to set and elaborate goals into information-rich networks--to plan a complex response to a complex rhetorical situation. It also raises the spectre of chaos.

3. Integrating Plans, Goals, and Knowledge

Writing is a powerful intellectual process precisely because it is both generative and open to reconfiguration. That is also why it is difficult. The fact that the planning process is so productive, that it can produce an expanding body of goals, creates its own problem and creates the need for mechanisms for integration beyond those supplied by a single schema or the writer's topic knowledge. Therefore, the way in which writers manage expanding information and still create a well-structured plan constitutes the third key feature in our description of constructive planning. We will use a sequence of snapshots of the working goals of an expert writer in order to track the growth of a writer's plans and answer the question: How do writers create a coherent plan?

In the following analysis, the transcripts of thinking-aloud protocols are divided into major planning episodes and numbered clauses (C1, C2...). The goal network (see Figure 2) which is inferred from this data (which includes the writer's notes and text) includes goals, subgoals, plans, and evaluative criteria. These goal nodes are numbered in the order of their appearance, but the graphic arrangement of links and nodes in a given frame reflects major conceptual links in the network at that point in the planning process. Because these goal networks are designed to bring the top levels of the goal structure into sharp focus, they do not include sentence-level goals and evaluations or local process goals, such as "I'll read this now." Notice too that this goal network is not the same as another equally important structure that also emerges over time, which is the structure of content information that constitutes the text plan. Although the present analysis concentrates on the goal network, one must bear in mind that the content structure and the goal structure exert a powerful reciprocal influence on one another.

For some readers, tracking a comment seen in a protocol to its place on a goal network may seem a little like threading a maze. However, the eight strategies we want to illustrate with these diagrams are themselves fairly straightforward. We developed the diagrams not only to analyze and compare all nine writers, but to see if this relatively simple analysis of linked goals could reveal some basic structural patterns, even though we (and you) will see other interesting ways this working goal network is linked. This particular protocol was chosen for an extended example, not because it is "typical," but because it was the richest mine of different planning moves.

Strategy 1: Exploratory Planning and Multiply-Linked Goals

Episode 1 in the protocol below shows how merely exploring an assignment can produce goals with multiple connections in the writer's own mind (connections which may or may not be useful later). This writer's exploratory path generates a series of related goals (Clause 10-14), followed by a reflection on (or invention of?) the reader--those tidy girls who like English for the wrong reasons. The writer then translates this vision of the naive audience into what becomes a major goal for this text (Clause 25/Goal #4) : "By God, I can change that notion for them."

Episode 1

[Legend for protocol transcription. C1 = Clause 1. (Goal#1) = Goal 1. N1 = Note 1. D1 = Draft Sentence 1. Reading is in *italic*. Writing is underlined. Dashes -- = short, approx. 2-5 second pauses. Dots ..... = longer pauses]

C1 *My job for a young, thirteen to fourteen, teenage female audience. Magazine: Seventeen*
C2 I never have read Seventeen
C3 But I've referred to it in class and other students have.
C4 This is like being thrown the topic in a situation in an expository writing class and asked to write on it on the board
C5 And I've done that
C6 And had a lot of fun with it --
C7 So on to the task at hand.
C8 *My job for a young teenage female audience. Magazine Seventeen.*
C9 Okay. Let's see -- Let's doodle a little bit.
C10 Job. English teacher (rather than professor) (Goal #1&2) (N 1)
C11 I'm doodling this on a scratch sheet as I say it --a--
C12 In fact that might be a useful thing to focus on --how a professor differs from -- how a teacher differs from a professor (Goal #2)
C13 And I see myself as a teacher
C14 And that might help them, my audience to reconsider their notion of what an English teacher does --a-- (Goal #3)
C15 *English teacher -- young teenage female audience*
C16 They will all have had English
C17 Audience -- They're *in school* (N2)
C18 They're taking English -- (N2)
C19 For many of them English may be a favorite subject -- (N2)
C20 Doodling still under audience [interrupts C19)
C19 But for the wrong reasons
C21 Some of them will have wrong reasons in that English is good because it's tidy --
C22 Can be a neat tidy little girl --
C23 Others turned off of it
C24 Because it seems too prim (N2)
C25 By God, I can -- change that notion for them (Goal #4)

C26 *My job for a young teenage female audience -- Magazine -- Seventeen* --a--
C27 *Job -- English teacher* --
C28 Guess that's what I'll have to go --
C29 Yeah -- hell -- go with that (Goal #5)
C30 That's a challenge -- relevant
C31 Riding a bicycle across England that's too easy and not on the topic -- right (Goal #6)
C32 Or would work in a garden or something like that (Goal #7)
C33 None of those are really my jobs -- as a professional (Goal #8)
C34 *My job for a young teenage female audience. Magazine -- Seventeen*

Episode 2

C35 All right -- I'm an English teacher -- (Goal #9)
C36 I want to get at the beginning (Goal #10)
C37 I know that they're not going to be disposed . . . to hear what I'm saying --
C38 Partly for that reason and partly to put them in the right -- kind of frame of mind I want -- (Goal #11)
C39 I want to open with an implied question or a direct one (Goal #12)
C40 And put them in the middle of some situation (Goal #13)
C41 Then expand from there to talk about my job more generally... (Goal # 14)
C42 And try to tie it in with their interests (Goal #15)
C43 So one question is where to begin -- what kind of situation? (Goal #16)

. . . . . .

The process of idea generation itself is a source of integration. Goals or ideas that emerge may be tied by simple association in memory, or they may be generated as part of an inferential chain linked by a causal, temporal, part/whole relations, etc., or they may be linked by belonging to some larger, well-specified schema. The first three goals in our example, which link "my job," the "teacher vs. professor" distinction and the writer's position on his own role, illustrate what looks like a richly linked set of ideas. Even freewheeling, exploratory generation contains connections.

The schematic version of this writer's goals in Figure 2 (Frame 1) can only weakly suggest the multiple links we can infer between goals such as, talk about my job and compare a teacher to a professor. And it does not capture at all the connections we can't infer buried in the mind of the writer. At this point a simple hierarchy is difficult to establish and no single goal appears to be the unique "cause" of another. However, we must remember that this initial structure *at the point of generation* is not necessarily appropriate for the task at hand. Such goals may need to be reconfigured into a new hierarchy and this content information may be radically restructured in the final text (cf. Hayes & Flower, 1980).

Key for reading frames

○	Open circles indicate nodes or goals
╲	Lines indicate links between goals
— — —	Broken lines indicate when the writer "pops up" to an earlier goal
1, 2, 3	Numbers indicate the chronolgy of goals
E	Indicates an evaluation of the writer's ideas; these become new goals
N	Indicates ideas written in notes
D	Indicates ideas writer put in draft
▭	Indicates an evaluative comment in the text

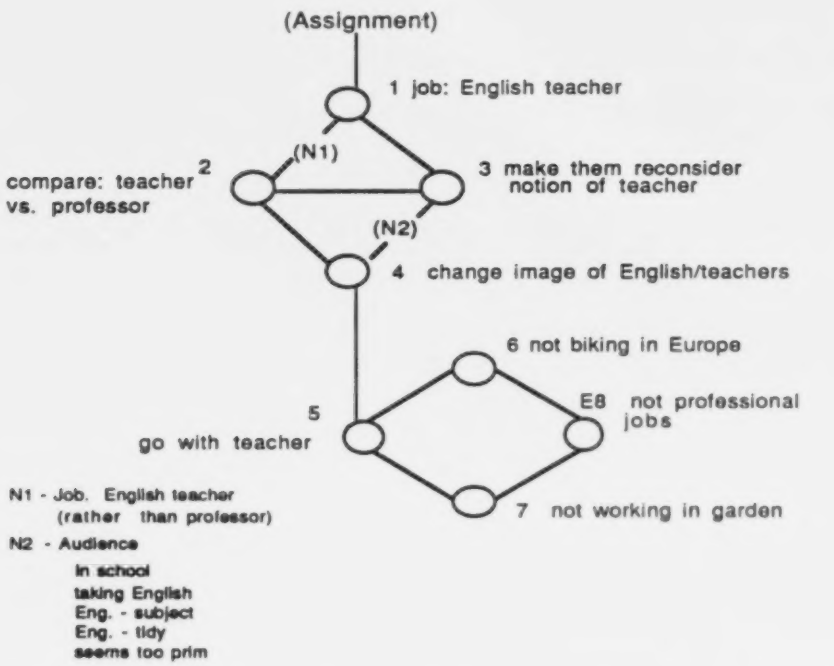


Figure 2. Frame 1

As Episode 1 and 2 illustrate, exploratory planning is often shut down by either a positive decision (#5, "go with teacher") and/or a negative evaluation of a potential goal (e.g., biking and gardening are not "jobs"). (We might note that the way in which writers handle the integrating strategies discussed here often gives us a good window on expert/novice differences. For instance, experts on this task rarely returned to an abandoned path; the novices did so regularly. And although both groups explored features of their audience, only the experts tended to transform such information into *goals for affecting that audience* as this writer did.)

Strategy 2: Creating Subgoals

A more controlled way of producing integration is, of course, top-down planning in which writers create a series of subgoals designed to carry out the goal above them in the hierarchy.

In the transition from planning Episode 1 to 2 (transcribed above), the writer wraps up his initial exploration with the decision and goal-setting statement, "All right, I'm an English teacher--I want to get at the beginning." In rather rapid succession he then sets four subgoals, which will themselves function as high-level plans and goals for the rest of the paper. As Frame 2 shows schematically, he wants (#10) to get (his readers?) at the beginning, (#11) to put them in the right frame of mind (he then elaborates briefly on these two interconnected goals at nodes #12 & #13). Then, he says, he will want to expand to his job more generally (#14) and tie this to their interests (#15) . The four goals connected directly to node #9 (i.e., #10, 11, 14, 15) are jotted down in his written notes and play a large role in structuring the text, in structuring his process (he returns to them to check up on his progress and recover his train of thought), and in organizing the rest of this planning episode. (The small box in the upper right hand corner of Figure 3 recaps the structure network up to this point.)

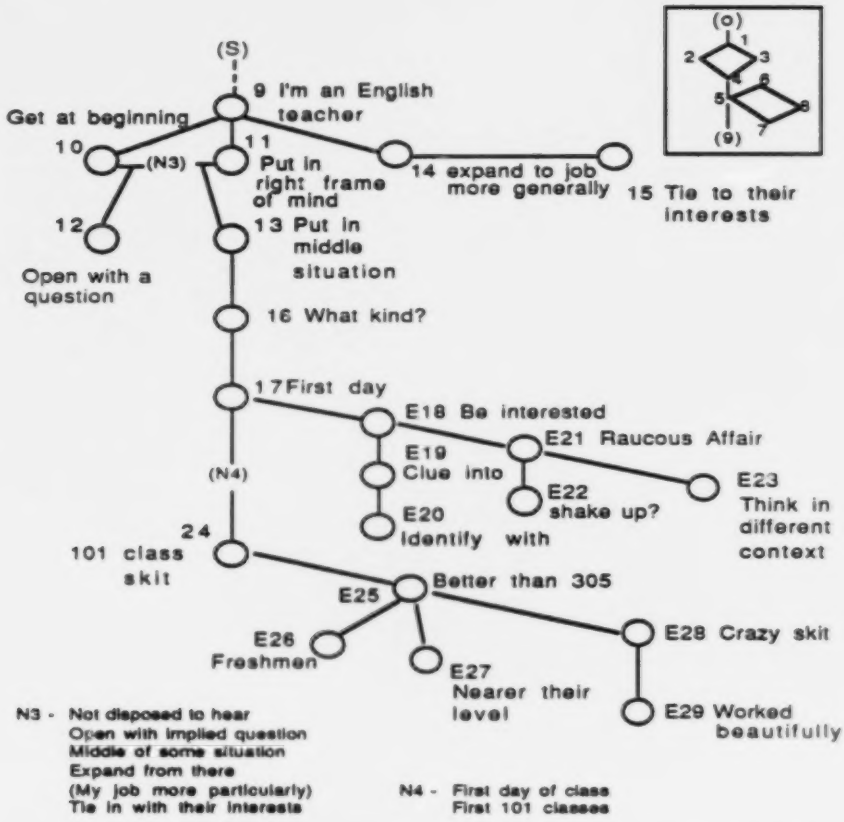


Figure 3. Frame 2

The rest of the episode, with its cluster of goals connected to #9, #10 and #13, shows a clear instance of subgoaling and testing which takes this form: if my goal is to get (the readers?) at the beginning and put them in the right frame of mind, I could achieve that with the subgoal of putting them in the middle of a situation, but (here follows a call for new subgoal) what kind of situation? The writer then generates an elaborate plan to support goals #10 and #11 based on telling an anecdote about his first day of class.

This episode also shows how nodes such as #18-23 and #25-29 enter the process as evaluations and tests of a proposed plan and become parts of the working goal network, coded here as #E18 etc. for Evaluation. Evaluation of his goals is a regular part of this writer's process which serves two purposes. It can encourage or shut down a top-down search for subgoals (#6,7,8). In addition, it often adds new criteria (e.g., find something this reader will identify with), and suggests constraints (keep it near their age level) that become part of the working goal network. The act of evaluating a proposed plan helps construct a better plan because it can generate goals and constraints that carry on, even if the particular plan that stimulated them is dropped. Evaluations also contribute to the integration of planning: soon these criteria will function as goals that guide the writer's attempt to work at the next level of the plan and to write an anecdote that will, indeed (E#22), shake the reader up.

Strategy 3: Monitoring Progress on Goals

Another way to get an integrated plan is to monitor your goals and progress, checking to see if your current effort is meeting your original goals. Writers, especially the experienced ones we observed, return to earlier parts of the network, popping back up to higher-level goals, either to extend those goals or to check on their progress. Episode 2 ends when the writer appears satisfied with his plan (#13-29) to get the reader in the right frame of mind at the beginning (a plan which carries out goals #10 & #11).

#E 28	And that skit really was crazy
#E 29	and it worked beautifully.
[C 56]	Okay --a-- let's see -- but before I actually write that I think I'll give myself some notion of where I'm heading --
	[Note: because this comment is treated as a process goal governing the writing process it was not included on the network]
#30	How I would expand that and just where I want to head with that
#31	How do I want to characterize my job-- more generally?

Nodes # 30 & #31 (which sit at the top of Frame 3) are simply restatements of the previous goal, #14 . Having popped back up to #14, the writer starts to work on it in the same top-down manner we saw in Frame 2, sketching out subgoals and jotting notes. (See Figure 4 which contains a recap of the Frame 2 network, Frame 3, and the notes written during this episode.)

However, at #35 this steady progress in interrupted. (See the Insert at the bottom of Figure 4.) As the writer is listing the "particulars" (#33) of what a teacher does, something in Note 5 sparks an association and a possible new goal:

#35	And I almost see there an opportunity to talk through this audience to an audience of parents and professionals.
#36	What do I mean by that?
#37	I wonder -- again I guess to shift the image of what an English teacher does
#38	Has that taken me far from the notion of being a teacher rather than a professor?
#39	I guess -- I guess not -- at least it may not, but it's hard to say at this point.
#40	Umm - teacher, the particular kind of teacher I am
#41	Okay -- let's see -- What about a sequence... [begins to reread notes]

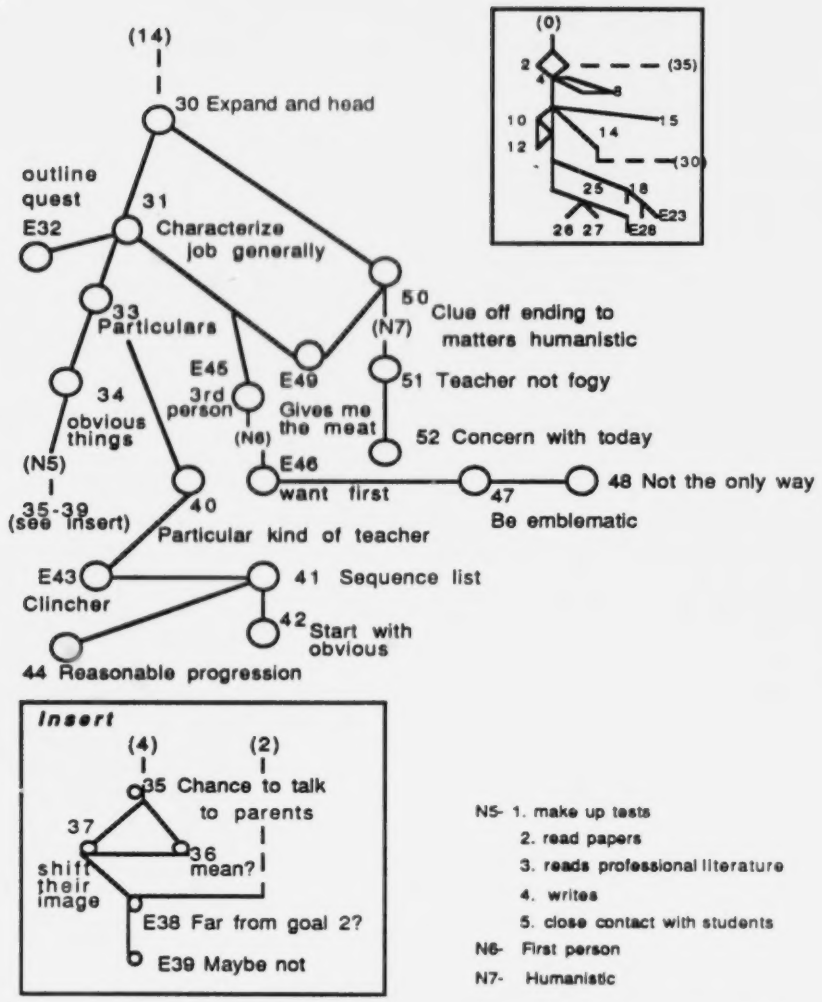


Figure 4. Frame 3

As the insert at the bottom of Frame 3 shows, the association that yields goal #35 sends the writer back up to the very top of his goal network (to goal #4). In asking himself "what he means" by this idea of "an opportunity," he sees that it is indeed his old friend , #4, the goal to "change their image." This leads him to evaluate his progress on those old goals, wondering "how far" his current plan (based on #4) has taken him from his contrast between teacher and professor (#2). (Note how in the network as we have inferred it, the segment from #35-#39 is linked directly to goal #4 rather than to its temporal neighbors. The writer has tentatively reconstructed some of his top-level goals.)

Episode 3, then, shows a writer maintaining coherence in his plan by remembering earlier goals, popping back up to develop them, seeing the link between a new "insight" and a previous goal, and, perhaps, most importantly, actively monitoring the coherence of this developing plan (e.g., will this new plan actually carry out goal #2?). When this writer has difficulty making a decision, he adopts a "wait and see" attitude. Monitoring the overall coherence of his goals appears to be a purposeful activity for this writer and one that he assumes he will conduct again later.

Strategy 4: Creating Goal Families

The top-down strategy we have seen here, in which the writer creates a clearly nested set of goals and subgoals, can produce a tightly integrated plan. However, it is not a good strategy for learning and modifying the plan as one goes along. The writers we observed also relied on a looser integration strategy which involved creating "goal families" in which goals could evolve and change without losing old connections.

To illustrate, over the course of the three episodes we have considered, goal #10 produced a number of what we might call "descendants": that is, goal statements, which are not strictly subgoals (i.e., actions which carry out the goal). Instead, they modify, restate, elaborate, or extend goal #10. Taken together, #10 and its descendants form a loosely linked family of goals and plans. Figure 3 shows the shape of this loose family tree. Early in the process Goal #10 splits into two elements--the goal to help readers reconsider their notion of English teachers and the goal to compare a teacher to a professor, which is phrased as a possible subgoal of the first. Each of these goals is elaborated and appears to be still held as a distinct purpose in the author's mind when the monitor steps in at #38 and he says, "has that (acting on #4) taken me far from (doing #2)?" However, his conditional approval of #40 suggests that the two lines are satisfactorily united in the current plan to focus on the "kind of teacher I am." Note the various forms this idea takes as the writer returns to it at Comments #10, #35, and #72.

10	Job--English teacher rather than professor
12	In fact that might be a useful thing to focus on how a professor differs from--how a teacher differs from a professor
14	That might help them--my audience--to reconsider their notion of what an English teacher does.
35	All right, I'm an English teacher-- I want to get at the beginning
37	(I know they are not going to be disposed to hear what I am saying. Partly for that reason) and partly to put them in the right frame of mind...
72	Again I guess to shift the image of what an English teacher does
73	Has that taken me far from the notion of being a teacher rather than a professor?
76	Hard to say at this point --um--
77	Teacher--the particular kind of teacher I am [Writer 1 then concludes that he now has the "a good part of the real meat of the thing"]

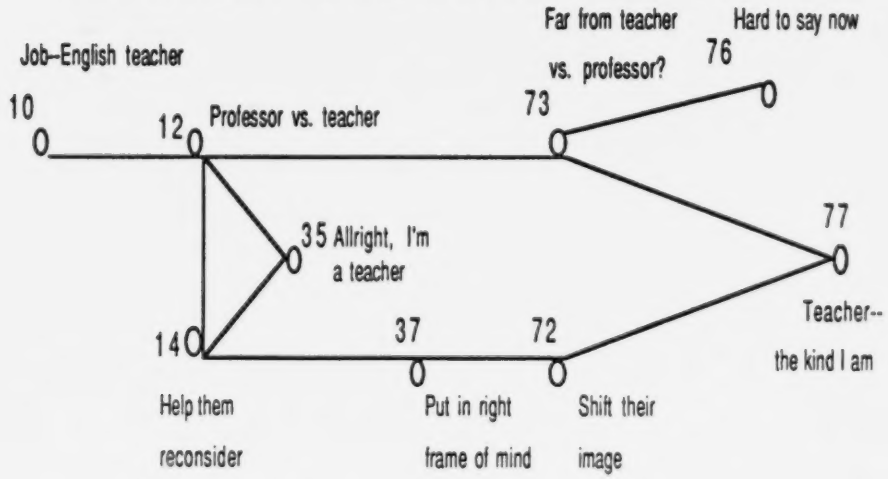


Figure 5. Goal Families

The members of a goal family all share a strong family resemblance ranging from mere restatement to significant modifications. In contrast to a forward-working solution process based on a series of subgoals, the creation of goal families often leads to elaborated or even alternative versions of a goal rather than simple progress. When the writers we observed eventually moved from planning to text production, the text sometimes reflected the most recent descendent of a goal family, but at other times the text looked more like a throwback to an earlier member of the goal family. It may be that writers do not always keep the different members of a goal family distinct in their minds.

Goal families have two notable effects. On the one hand, they foster integration and help maintain information in attention by keeping a network of associated and alternative plans active. On the other hand, the close ties among members of a goal family seem to increase the chance of forgetting the most recent (and supposedly "better") modification or descendent. After an interruption writers may forget their "best and last" variation and go back to the mother goal or a near relation, especially if that earlier member of the family had been well rehearsed (cf. Kintsch and Vipond, 1979).

Goal families are an important feature of writing for another reason. These variations on a theme bring lexical schemas--the rich networks of associations attached to particular words--into the goal setting process. The implications stored in given words can come, as Wordsworth described it, "trailing clouds of glory," and introducing large packages of information and modifications to a plan, coded in just a change of phrase, a change which may be hard to infer fully from a protocol comment. On the other hand, the same rich set of meanings we see in an emerging goal family or that a writer may see in certain "loaded" words, may be completely invisible to the reader of the final text. For all their impressive complexity, these lexical networks and goal networks still have to be translated into effective text.

Strategy 5: Intention Setting

Much like the "watcher" strategy Bird (1980) observed in readers, writers set up a watch for information that will fulfill their intentions. When the writer in Frame 3 asks if his current plan is going to take him too far from goal #2, and he can't answer the question, he sets an intention to maintain both goals and to check again on the outcome. Another writer decided that his title was "corny," but couldn't see a way out of the dilemma, so he simply put the problem on hold until a new possibility presented itself.

Unlike an opportunist capitalizing on chance, these writers are setting a goal *to find* something, and they are sketching specifications for the something they want to find. Intentions, as we are using the word, are goals that are not yet fully specified or defined. Any number of specific goals, which meet the intention, might do. Having an intention (rather than a specific goal) puts writers in the posture of looking for an opportunity or idea that will instantiate the intention or solve the problem. Intention setting (and remaining alert to opportunities) can exert a powerful integrating force on writing at little cost in active problem-solving. It can lead to connections between distant parts of the plan when the writer suddenly sees that a current goal could serve double duty and fulfill that earlier intention as well.

This strategy of setting an intention to figure out a plan at a later date also appears in the revising process of experts, who notice problems in a text but delay action (Hayes, et al., 1987). In both that study and the present one it was difficult to tell to what extent writers recall and faithfully act on such intentions. One suspects that they also use intention setting to satisfice and put certain nagging goals or criteria, which have pushed themselves into attention, back onto permanent hold. However, this strategy, in conjunction with consolidation (below), seems one of the most powerful ways writers manage an open-ended, generative planning process and still create an integrated plan.

Strategy 6: Consolidation

Consolidation, our final strategy for integration, was the least frequent, but perhaps the most important operation we observed. The strategy of consolidation allows writers to engage in wide-ranging idea generation, to toss off alternative plans and goals, to go off on potentially productive tangents and produce semi-independent clusters of ideas or even prose, in short, to follow a variety of independent, even contradictory paths of exploration and to still produce a coherent plan. *Consolidation, as we will define it, is the mental act of pulling selected plans, goals and ideas into attention as a freshly integrated whole.* The concept of consolidation refers to a family of actions which share this function of integrating old or disparate parts of the goal network (and the content network) into a current working plan. We observed three distinctive forms consolidation took.

The most familiar form of consolidation operates on topic knowledge when a person translates three pages of text or an entire conversation into a gist, especially when that gist must be inferred or constructed. Consolidating knowledge into gists is an effective, learned reading strategy (Brown and Palincsar, in press), which writers also use when they turn ten minutes of their own idea generation into a gist or to turn their gists and notes into a more inclusive theme or organizing idea for their text. It is easy to see the importance of consolidating and reorganizing topic knowledge, in part because it is easy to trace the process through changes in notes, outlines, and drafts. The process of consolidating goals and plans may be equally important--perhaps it is even the instigator of many content changes--but it is harder to see.

The second, and most dramatic, form of consolidation we call the "new plan" consolidations, in which previously mentioned, independent goals are united in a newly created plan. Sometimes new plan consolidations are self-consciously managed events. For instance, one writer initiated a new planning episode by looking back at a page of narrative she had just written in order "to sort of reflect to myself what the structure is that I'm following or -- or coming up with as I go along." She used this rereading of her own text to create an updated plan. She then consolidated this updated plan (based on text she clearly wanted to save) with another set of previous goals. This consolidation (of updated goals inferred from the text plus previous, but still unmet goals) generated a brand new plan that guided the next phase of her writing process. These "new plan consolidations" are not only moments of real invention in the writing process, they are also a conservative force that allows experienced writers to save prior text and clusters of plans, even as they are revamping their current working plan. They resolve some of the conflict between allowing for discovery and learning-as-you-work, while still keeping the plan coherent, and even maintaining cumulative progress on a text.

A third kind of consolidation takes the form of a selective review of goals that are relevant to the task at hand, a sort of "taking stock." In this case we do not see new information or a new plan emerge, but we do see writers in the act of bringing distinct clusters of previous and new goals together in order to monitor the status of those goals or to rehearse a plan. This sort of consolidation is operationally defined as an episode in which writers are clearly taking time to review multiple strands of their goal network in conjunction with one another. These review consolidations appear to have a variety of functions, working as an aid to memory, a way to evaluate goals as a unit, or a way to monitor progress. A simple instance of such a consolidation occurred at the end of Episode 1 above, when the writer, after considering the alternative goals he had generated, began Episode 2 with "All right -- I'm an English teacher."

In these review consolidations writers often focus on goals relatively high in the goal structure which have a cluster of subgoals attached to them. It is often impossible to tell from a protocol how much of the information attached to that cluster is actively represented at that moment in the writer's mind or what degree of reconfiguration, if any, has occurred during the review. However, even without knowing what all may be taking place during this process, the very fact that writers are engaging in this review consolidation is interesting--and it was a distinctive feature of the experts we studied.

Figure 6 is designed to show the frequency with which expert and novice writers undertook either new plan or review consolidations and the complexity of those consolidations. Let us use Expert #4 to explain this figure. We had identified three distinct goal families in this writer's planning network: one was concerned with the audience, one with his job (which he defined as being "in college" as an NEH Fellow), and one involved his role as a free-lance writer (based on the experimenter's suggestion to treat the task as a free-lance writer might). The first consolidation occurs when he unites two of these clusters (the free-lance approach and the audience) by creating a new goal to "come at it from their experience." This first consolidation is numbered 1. in the figure. Each of the two goals clusters he unites is represented as a vector or arrow in the figure. At this point in his protocol the free-lance cluster contained only two goals comments and the audience cluster contained three, which are represented by the number of dots on each vector. So the graphic then tells us that at this point, two goal families (one with two and one with three goals in its cluster) were involved in a consolidation. A second consolidation, shortly after the first, and numbered 2. in the figure, unites the job cluster and the audience cluster in a plan to "define my job in consideration of the audience." And a third consolidation, to "tie this back to the way I began," unites the free-lance cluster (grown in the meantime to five goals) with the job cluster. In sum, the figure shows us that Expert #4 made three consolidations during that hour of planning and writing and that each consolidation involved a few more goals than the first.

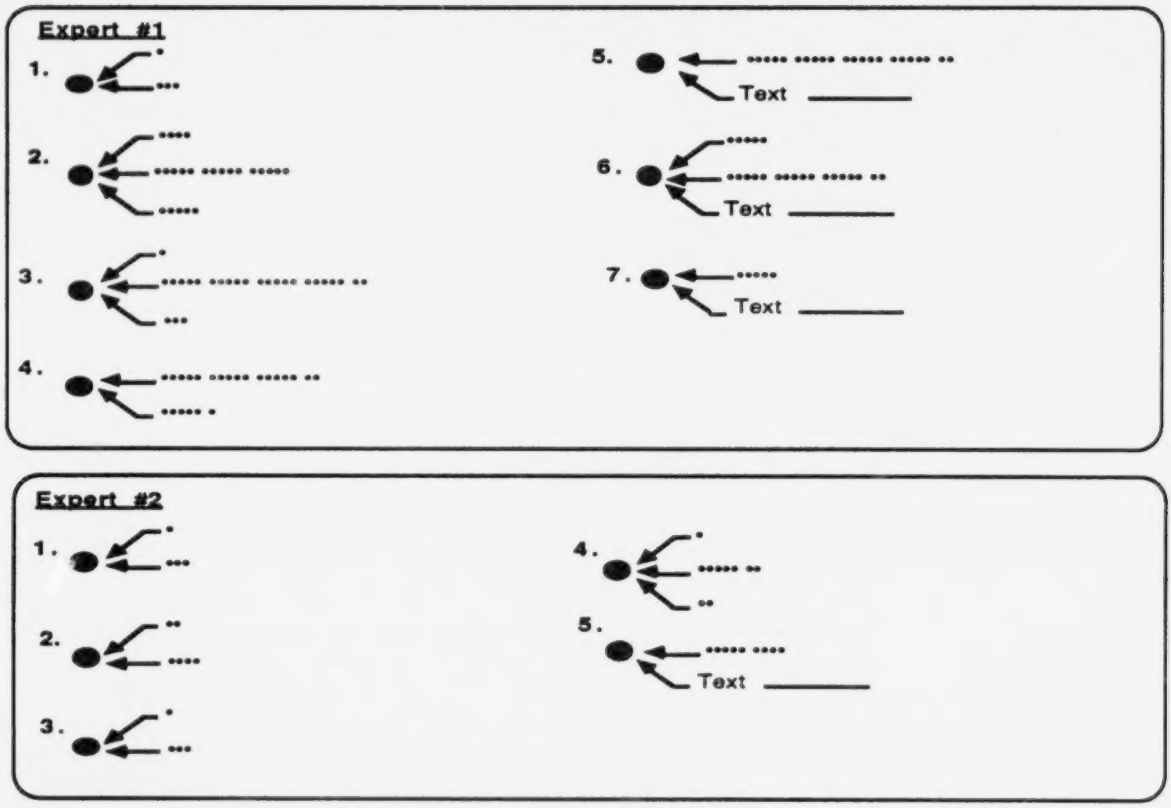


Figure 6. Consolidations

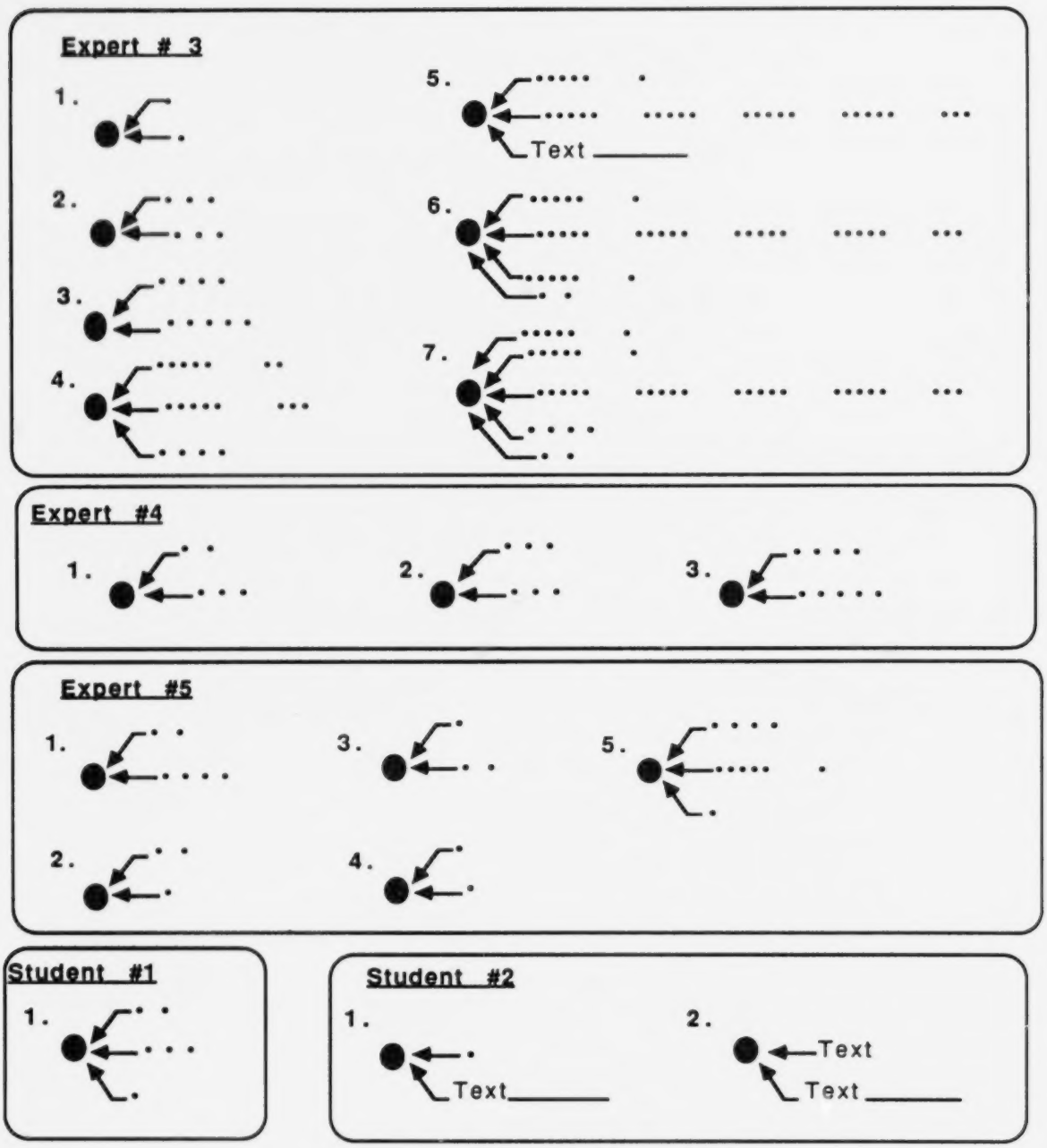
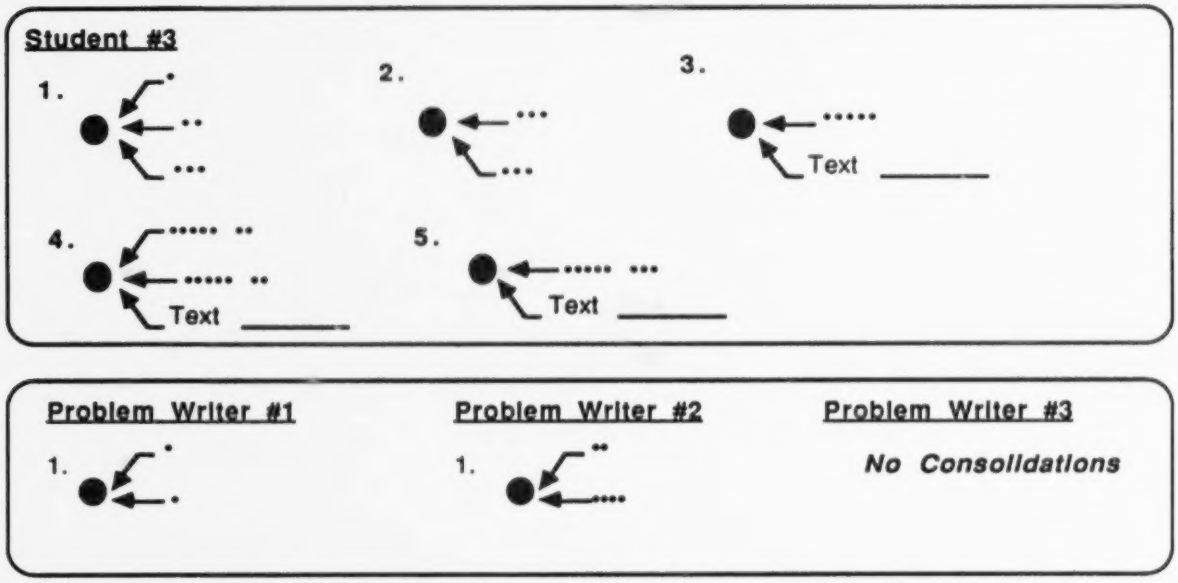


Figure 6. Consolidations



Frequency and complexity of consolidations in expert and student writers.

Key

- • Consolidation
- ◄— Goal Family
- .... Goals

Figure 6. Consolidations

In the vectors in Figure 6 we have included "text" as a vector when prior text was clearly part of the information being reviewed or integrated in the consolidation. In this analysis a consolidation with many vectors means the writer was considering a number of goal clusters (e.g., reviewing or mentioning a key term from each cluster). If a vector has many dots, however, that does not mean that each goal in the cluster was mentioned; it only means that the cluster, to which the mentioned goal belongs, is large.

A long vector typically reflects a writer who is working at the top level of her goal structure, bringing highly elaborated clusters into connection with one another. The profile of expert consolidations is clearly more complex that than of the less experienced writers. However, a simple tally would miss the point. As the figure shows, consolidation is a relatively low frequency event even in experts. And more is not necessarily better. Student #1, who produced one of highest ranked papers, integrated her three major clusters into a workable plan relatively early in composing with one consolidation. Student #2, whose paper was not highly ranked, had two consolidation episodes which were nearly verbatim reviews of the assignment and of his indecision about his topic. Consolidation is a tool that can be used in many ways. On the other hand, it is worth noting that the problem writers are not even using it in limited ways. Despite our caution about a simple quantitative interpretation of this data, when consolidation does appear, it can be enormously powerful since it can forge links at the top levels of the goal structure and unite large clusters of information.

This process of consolidation also lets us distinguish constructive planning as an executive strategy from opportunistic planning--a strategy described by Hayes-Roth & Hayes-Roth (1979), which their subjects brought to the task of planning errands. In contrast to a managed, hierarchical

planning process, an opportunistic planning strategy adds new elements to the plan whenever (or if) an opportunity or stimulus presents itself to the planner. Many of the features of the opportunism they described in errand planning go on in writing as well:

- Planning can go on at any level of abstraction-- from global goals to a potential word or phrase.
- The process is multi-directional--an independent decision made at one level can lead to decisions above or below it in abstraction.
- Because plans are not compiled "programs" but a set of decision rules operating relatively independently, a planner can depart from a current path without restarting the planning procedure.
- Finally, planners can create contradictory planning elements.

As an alternative to more rigidly scripted planning procedures (such as top-down or bottom-up planning), opportunism allows for a flexible response to new information. Writing makes regular use of *local* opportunism. It makes the planning process multi-directional and able to respond to changing conditions. It accounts for the experience of discovery and serendipity writers often report. However, it is useful to distinguish local instances of opportunism, which must occur in most problem-solving, from opportunistic planning as an *executive level strategy*.

When opportunism is operating as an executive-level planning strategy, various parts of a *heterarchical* agenda can be independently maintained and executed without conscious attention to managing and integrating plans on the part of the problem-solver (Hayes-Roth, 1980). In essence, local decision making in response to opportunities is said to be enough. Such a strategy appears to be adequate for errand planners whose task is to arrange information in the most efficient order. However, in expository writing the planner must eventually produce a *highly integrated hierarchical plan* for a coherent text. A planning process that was merely opportunistic could generate a jumble of plans with no mechanism for creating a single, integrated plan. For errand planners who are carrying out predetermined goals this mechanism is apparently not necessary and the load on working memory is not large. But writers must typically generate and structure not only information but the goals for the task as well.. The most likely outcome of a merely opportunistic process in writing would be a locally coherent, but globally confused text.

In the experienced writers we have observed, managing their plan appears to take a good deal of attention. The writer's problem is how to take advantage of local opportunism and *still* construct a hierarchically coherent plan. Consolidation does this by periodically reviewing and integrating goals, ideas, and text, and at times by constructing new syntheses and new plans. It absorbs opportunism into a more highly goal-directed planning process. Not all attempts to consolidate or integrate goals are successful, however; writers may be unable to generate a new plan or deal with conflicts among the old. Nevertheless, these attempts are a distinctive feature of the experienced writer's process.

At the beginning of this section we suggested that integrating plans, goals and knowledge was a critical feature of constructive planning. It might better be described as a large hurdle created by the very open-ended, generative process this planning strategy fosters. (Both knowledge-driven and schema-driven planning, by contrast, are designed to minimize this problem of building a unique integrative structure.) We observed six strategies writers use to achieve integration, ranging from the familiar processes of exploring linked ideas, creating subgoals, and monitoring progress, to the more distinctive strategies of creating goal families, setting intentions and consolidating. Of these, consolidation is the most robust and the most powerful: it operates under a variety of conditions and makes far reaching changes in the plan. It is also probably the most critical to the success of a constructive strategy. Whether consolidation leads to a gist, a new plan, or to a selective, integrative review of plans so far, it is one way writers can turn the fruits of opportunism, rhetorical invention, unexpected discovery and learning into a tightly coherent and highly goal-directed plan.

4. Instantiating Abstract Goals

The fourth critical feature of constructive planning is a response to another hurdle, this one created by the abstract nature of many plans and goals. Moving from a plan to text can be an enormous leap for writers, since it may involve feats such as translating a nonverbal representation of knowledge into a verbal one, turning experiential, episodic knowledge into semantic form, or taking on the linguistic constraints of standard written English (cf. Flower & Hayes, 1984). Writers must "instantiate" a goal like "shake 'um up" by creating an "instance" of that plan in a sentence or text , and deal with the fact that a top-level goal such as this could be instantiated in radically different ways. For example, in our illustration, the writer begins Episode 4 (Figure 7) by reviewing his notes and progress on those top level goals (#10,#12, #13): "All right--let's see . . . going back to that first paragraph then -- 'Open with an implied question -- or at any rate go to the middle of some situation the first day of class'." That leaves one goal (#15) unfinished, which he then restates as a question: "How can I get that to relate to a group of, a young teenage audience of girls?" How, indeed? How do you instantiate all these goals and constraints in text --how do you carry them out in an introductory sentence? As we see in Frames 4 and 5 , he considers a number of possibilities ranging from playing up sex to disguising rhetorical theory. The problem is not just to write an introduction--this writer certainly knows many conventional schemas for openings. The problem is finding a path from that abstract goal ("relate to young girls") to an instance of that goal embodied in text, which also honors the other elements of his plan. At this point of text production, many powerful planning strategies, such as working with abstract representations (Sacerdoti, 1974), only widen the gap between plan and text. The ways in which writers solve this problem will be an important feature of constructive planning. We observed two general strategies used on this task.

Strategy 7: Using Code Words as Pointers

One strategy for closing the gap is to plan with code words or concepts which are in fact pointers to well-developed packages of knowledge in the writer's memory. Goal statements such as #58 ("What about ethos, pathos, logos?") appear to point to a well-structured, easily verbalized body of prior knowledge that leads directly into potential language for the text:

C124	Okay. Yeah -- how about that . . .
C125	Ethos -- how you present yourself
C126	Concern . . . teenage audience would have . . .
C127	Pathos -- how you're seen
C128	Logos -- concern with the subject matter
C129	Okay, If I can disguise that

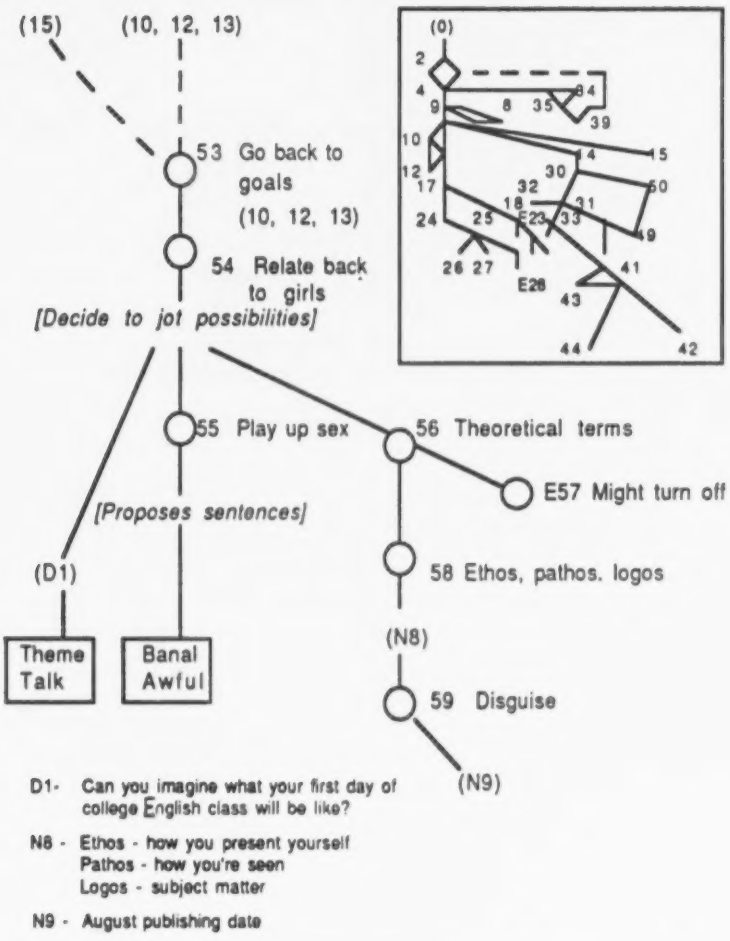

(15)
(10, 12, 13)
53 Go back to goals (10, 12, 13)
54 Relate back to girls
[Decide to jot possibilities]
55 Play up sex
56 Theoretical terms
E57 Might turn off
[Proposes sentences]
(D1)
58 Ethos, pathos. logos
(N8)
Theme Talk
Banal Awful
59 Disguise
(N9)
D1- Can you imagine what your first day of college English class will be like?
N8 - Ethos - how you present yourself
Pathos - how you're seen
Logos - subject matter
N9 - August publishing date

Figure 7. Frame 4

Goals such as #50 ("and [for] the ending of it I can clue off this close contact with students to talk about, hell, I don't know, matters humanistic somehow") suggest that this writer may have a schema of plans, procedures and criteria for wrapping up a paper with a concluding peroration on "matters humanistic." Such a schema might even offer a selection of appropriate commonplaces as well as easy access to appropriate features of vocabulary, tone, and style. Plans that are based on such pointers might allow the writer to reel off substantial stream of text with little additional planning (assuming, of course, that once the node is unpacked it is indeed rich). For another writer, however, the same concepts (e.g., the ethos, pathos, logos trio from classical rhetoric) might represent a very abstract and hard to instantiate plan.

Strategy 8: Creating How-to Elaborations

Writing teachers often make a perplexing observation about planning. In writing conferences students often present persuasive and articulate top-level plans for a paper, yet the paper which appears four days later may be a limited, even barely recognizable instance of that plan. Our data showed writers facing this same problem of instantiating goals in text--of creating an instance of a complex plan in a given sentence. However, sometimes this gap between global goals and text is bridged when writers create "how-to" elaborations--that is, a body of local goals and tests that turn abstract goals into more concrete, operational ideas for "how to" carry out a particular plan. These how-to elaborations exist at the middle levels of the goal network--close enough to text to guide the

production of pre-text and sentences (Witte, 1987), yet abstract enough to have the flexibility of planning.

Frames 4 & 5 show our writer trying to move from his well-formed, top-level plan into text, trying to write the first sentence. He begins by gambling on a direct leap: "just jot down some possibilities." When his initial attempts at drafting this first sentence (D1) fail (he evaluates them as "theme talk" and "banal"), he asks himself "how" he is going to link this theory to his job (node 60) and begins to create a series of mid-level, how-to elaborations that seem to work as a troubleshooting technique helping him build a bridge between plans and text.

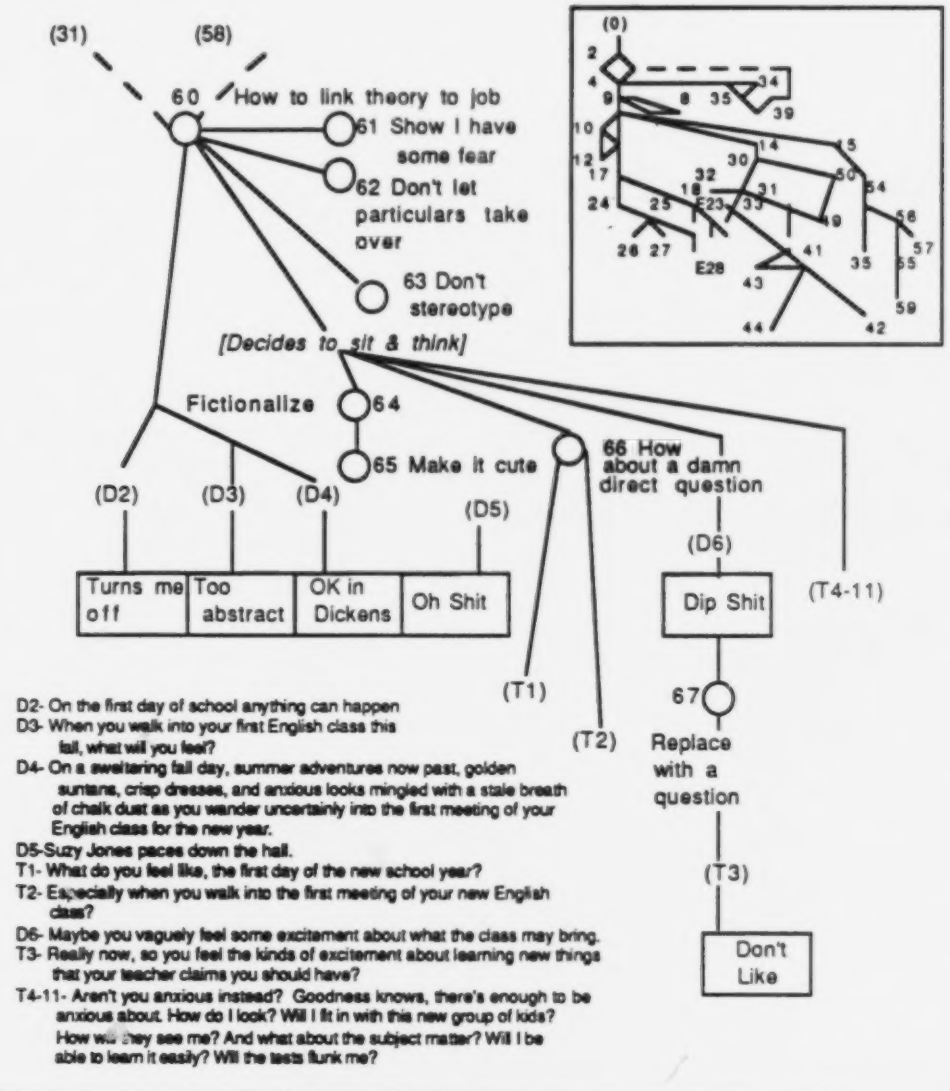

(31)
(58)
60 How to link theory to job
61 Show I have some fear
62 Don't let particulars take over
63 Don't stereotype
[Decides to sit & think]
Fictionalize
64
65 Make it cute
66 How about a damn direct question
(D2)
(D3)
(D4)
(D5)
(D6)
Turns me off
Too abstract
OK in Dickens
Oh Shit
Dip Shit
(T4-11)
(T1)
(T2)
67
Replace with a question
(T3)
Don't Like
D2- On the first day of school anything can happen
D3- When you walk into your first English class this fall, what will you feel?
D4- On a sweltering fall day, summer adventures now past, golden suntans, crisp dresses, and anxious looks mingled with a stale breath of chalk dust as you wander uncertainly into the first meeting of your English class for the new year.
D5-Suzy Jones paces down the hall.
T1- What do you feel like, the first day of the new school year?
T2- Especially when you walk into the first meeting of your new English class?
D6- Maybe you vaguely feel some excitement about what the class may bring.
T3- Really now, so you feel the kinds of excitement about learning new things that your teacher claims you should have?
T4-11- Aren't you anxious instead? Goodness knows, there's enough to be anxious about. How do I look? Will I fit in with this new group of kids? How will they see me? And what about the subject matter? Will I be able to learn it easily? Will the tests flunk me?

Figure 8. Frame 5

For this writer, elaborating on how he might achieve his goals is an alternative to working at the level of text. When the direct leap from an abstract plan to a first sentence doesn't work out, this writer abandons the effort to produce sentences in favor of creating local goals or alternative subgoals that operate just above the level of text. For example, at node #56 our writer nixes the plan to "play up sex" in favor of the goal to "use theoretical terms." (One can appreciate the need to

think over just *how* this is going to be done.) He begins a new episode (Frame 5) by trying to link this paragraph-level plan with his top-level goals: "Now how'd I get all that -- linked -- that was that ethos-pathos-logos bit -- linked to -- how I see my job. Well hell, its transfer. Show them I have the same fear."

At this point he tries Draft Sentence 2 (D2) followed by D3, which even a new sheet of paper doesn't pull through: "It ain't a bad idea but it's too abstract." So he returns to planning, and his comments at #62-63 are focused on precisely this problem of representing a plan in actual text: "How do I put that in a particular situation without letting that paragraph take over the whole paper?" D4 doesn't make it either: "God Almighty, might have a place in Dickens. . ." And he pops up again to mid-level planning that includes goals such as, "fictionalize it," "make it cute," and his final, successful plan, "how about a damn direct question?" The distinctive feature of this strategy is that the writer is elaborating ideas for how to carry out his goals and plans, in this case working just above the level of text, rather than working solely with alternative versions of text. These how-to elaborations and this use of goal setting at the point of text generation were rarely observed in our novice writers.

Writers make a clear distinction between planning and text production, since even Draft Sentences take on the large body of written language's formal constraints. This change from planning to text production is often signalled by a writer's comments and is apparent in textual features, such as complete sentences, caps, etc. (Hayes & Flower, 1980). On the other hand, producing text is not a leap from one kind of knowing to another, from pure thought to text, but is a process of instantiating an abstract representation of meaning, such as a set of top-level goals and ideas about content, with another representation, such as a body of mid-level elaborated plans or a detailed text plan which specifies a question or "cute" wording. The writer is working with a series of representations of meaning in which abstract global goals can be instantiated with further goals and subgoals, schemas and their pointers, rough notes, orally proposed sentences or pre-text (Witte, 1987), draft text, and finally with accepted text (Flower & Hayes, 1984). We view the text then as simply one possible representation, one additional instantiation of the writer's goals. When the first sentence (T1) finally emerges, it is just one further expression of the knowledge and goal structure to which it belongs.

5. Resolving Conflicts

Facing conflicts was a surprisingly common experience for these writers. In these encounters, goals come in contention with each other, or the text is in violation of certain constraints, or intentions run into the barrier of the writer's own inadequate topic knowledge. Such conflicts can fuel frustration and writer's block, and yet, a sensitivity to conflicts may be one road to an integrated plan. Conflicts, problems, or disjunctions indicate where the semi-independent parts of a plan or text are not in harmony. There were, however, some suggestive differences in the kinds of conflicts these writers saw and how they dealt with them. Since this analysis did not depend on the detailed goal maps used earlier, it includes two additional experienced writers for a total of five experienced and six student writers. Instances of conflict, which were identified with 85% reliability by raters, were statements in the protocol which identified two or more conflicting elements or evaluated one such element as in conflict with some implicit standard. These statements fell into three groups:

Generic, Text-based Conflicts

These statements of conflict are vague, evaluative comments which typically note generic problems such as a spelling problem or sentence fragment. There is little indication that the writer is at this point considering the specific constraints, requirements, or goals of this task: the *text* is in conflict with some *generic* set of constraints that would operate in most any task. Some examples:

"This is bad."
"Boy, is this lousy."
"I hate this tone."

Task-specific, Text-based Conflicts

These statements of conflict differ from the ones above in two respects: they are *specific* to this task and they are typically more *elaborated*. Some aspect of the writer's emerging text has come in conflict with some goals or constraints specific to this particular task: with the assignment, with the writer's conception of the audience, or with the writer's own unique goals for the text. And the statement of conflict contains more specific information about the problem than a generic, "this is bad" evaluation. However, these two categories are alike in that they are text-based. They arise from a generate-and-test process in which writers produce text which is then compared to or tested against their goals or constraints and found to be in conflict. This category, then, sees the text in conflict with goals, plans or constraints. Some examples of task-specific conflicts:

> "They're not going to understand this."
> "This is too risque for Seventeen Magazine.
> "That sets up too much of a dichotomy."

Active Goal Conflicts

These conflicts occur between goals, plans and constraints themselves before text is produced or in a way that is not specifically bound to text. Before the paragraph which would carry out a goal is drafted, the writer realizes that a current plan to be "interesting," say, is in conflict with a larger goal to be "truthful" about her job. Or two process plans for what to do next are incompatible: the writer thinks she should stop to make some abstract ideas concrete, but clearly wants to get on with the writing. Or perhaps two of the writer's larger goals, generated at different times, are coming into conflict: the writer wanted to make this comprehensible to fourteen year-old readers, but finds he does not want to oversimplify his discussion of steam turbines. Unlike the first two categories, these conflicts were not triggered by written text, but like the Task-specific conflicts, they were linked to specific goals for the task at hand. Although this need not be so, these goal conflicts were also typically accompanied with an even greater amount of specification and self-awareness. Some example of active goal conflicts:

> "I want to put this in a particular situation without letting the paragraph take over the whole paper."
> "OK, so I have to talk about my job to these kids . . . but I'm not even sure they're interested in my job.
> "This isn't the place for a sociology of the academic world, yet that's what I'm interested in."
> "I want to really be truthful here--straightforward about what it's like. But how will that rest with the editors?"

Table 1 shows the distribution of these kinds of conflict across experienced and student writers. The total number of conflicts for the two groups are similar (32 for experienced, 40 for students). However, the totals for each kind of conflict reveal an interesting difference. Both groups note a similar number (and proportion) of Task-Specific Conflicts (around 40%). However, the students devoted 53% of their attention to the more vague, Generic Conflicts (versus the experienced writers 16%). Conversely, the experienced writers saw many more Active Goal Conflicts (40%) than did the students (5%).

	Total Conflicts	Generic Text-based	Task Specific Text-based	Active Goal
Student Writers				
1	4	4	0	0
2	10	6	4	0
3	5	3	2	0
4	8	3	4	1
5	7	5	1	1
6	6	0	6	0
Total	40	21	17	2
Percent of Total		53%	42%	5%
Experienced Writers				
1	4	0	3	1
2	5	3	1	2
3	7	1	4	2
4	6	0	2	4
5	10	2	4	4
Total	32	5	14	13
Percent of Total		16%	44%	40%

Table 1. Goal Conflicts in Student and Experienced Writers

Perhaps the most interesting pattern here suggests how heavily the students are relying on evaluation of already produced text: fully 95% of their conflicts are text-based conflicts with only two single instances of Active Goal conflicts among the six student writers. The students appear to be generating and testing text rather than taking advantage of the efficiency planning might offer. While many of the experienced writers' conflicts are also text-based, 40% of them occur before text is produced, before a plan is carried out in the expensive medium of written text.

Secondly, the kinds of conflicts a writer sees may indicate whether the writer is relying on a knowledge-driven or schema-driven executive planning strategy or on constructive planning. The first two strategies can rely in large part on generic goals, conventions and standards: we would expect conflicts to be clustered in the Text-based, Generic category, much as we saw in the student writers. For instance, one student who appeared to rely on a consistent knowledge-driven strategy, confronted only four conflicts-- all of them between the text and standard rules, especially spelling. By contrast, constructive planning leads to new goals (which may not be in harmony) and to goals that are constructed for this unique writing task. We would expect to see not only an increased number of Active Goals coming in conflict (40% in the experienced writers), but a greater attention to the Task-Specific Conflicts, whether they involve goals or text. On this task, 84% of the experienced writers' conflicts involved these unique or task-specific problems.

These conflicts were another indication that the experienced writers were *constructing* a unique task and a plan for themselves, despite some of the costs such planning entails. However, the way writers choose to resolve these conflicts shows some of the benefits of both constructing a plan and being sensitive to conflict. The writers in this study had four general ways of resolving conflicts which ranged from simply ignoring an annoying element to creating a new resolution that satisfied all the contending goals and constraints:

Choose Among Goals

When the contending elements in a conflict are recognized, writers will sometimes choose simply to pursue one goal (plan, constraint) and drop another. Sometimes this choice is overt: "Oh, I guess I'll just assume the audience will understand this," or "I"d like to make this less formal, but I just don't have time." Other times the choice is not verbalized but appears to occur, as when a writer notices a problem or contradiction but then ignores it.

Produce New Text

In some cases the writer simply rewrites or replaces text. This kind of resolution is usually in response to text-based conflicts and is almost always local, at the word or sentence level. There is no evidence here that the writer created a new plan or considered more than a local issue.

Make A New Plan

Writers may respond to a conflict by coming up with a new plan which avoids the problem. For instance, the writer described in Figure 8 realized that the idea he was developing was *pontifical* and *abstract* when it needed to be couched in *the right level of language* for that audience. His solution was a series of new plans: *Fictionalize? No. What about a direct question*? Unlike the decision to Produce New Text, this response to conflict works at a more global level of the problem.

Consolidate Goals in a New Plan

In a few instances we see writers actively trying to bring together the entire set of conflicting concerns and to salvage everything. The New Plan resolutions, described above, aim a bit lower, in that they typically "hedge" or favor one conflicting element over another as the writer attempts to solve an immediate problem. Consolidations try to integrate multiple concerns into a new plan. One writer, who went through an extended episode of conflict, questioned whether she could even complete the assignment as she realized that her current text was becoming too abstract and political for *Seventeen* readers. She resolved the conflict by accepting and consolidating her concerns: she decided "to present my message in an honest and straightforward way," believing that honesty would reach the audience. Her eventual solution brought together a number of subgoals that had been in uneasy conjunction, which included reaching the readers, being truthful, and making the assignment interesting to herself. Moreover, this solution let her salvage all of her previously written text. When writers solve conflicts through Consolidation, they attempt not just to move around conflicts (as in the New Plan moves) but to satisfy all the conflicting goals and constraints in a way that doesn't give up anything.

Table 2 shows the decisions these writers made. Both groups used the Choose strategy between 50% and 60% of the time. The students used the local strategy of creating New Text more frequently, 13 times to the experienced writers' 4. The students had few New Plans or Consolidations (one of each type), while these accounted for over a quarter of the experienced writers' attempts. Once again, the experienced writers are dealing with conflicts at the level of the plan, not just the text.

Resolution Strategy	Student Writers		Experienced Writers	
Choose	25	(63%)	16	(50%)
Produce New Text	13	(33%)	4	(13%)
Make a New Plan	1	(2%)	9	(28%)
Consolidate	1	(2%)	3	(9%)
Total	40		32	

Table 2. Conflict Resolution Strategies in Experienced and Student Writers

Another difference between these groups that is supported by these numbers but more apparent in the protocols, points to how writers think about their goals. The students in this study often treat their goals as static or "non-negotiable" demands--the sort of rigid constraints that force a writer to choose among conflicting elements or generate new text. By contrast, the experienced writers treat their goals as much more fluid and open to revision and change. The following examples illustrate this difference.

One of the better student writers in this study who seemed to have a particularly non-negotiable set of goals, used the Choose strategy to resolve every goal conflict. She wanted to write an essay describing her job as a barmaid and quickly established her goal to write an introduction "to bring the reader in." She starts by listing names of drinks which would be "fascinating" to the reader. The need to be "interesting" or "fascinating" dominates both the writing session and the conflicts. Early on she runs into conflicts between some of her "interesting" drink names, such as "chocolate banana" and "cork-sucker," and the constraints she attributes to the magazine's editorial policy, which might find them "too risque" for *Seventeen*. The Choose strategy she uses to resolve the conflict seems entirely appropriate here: she merely crosses the offending drinks off her list of text notes.

Later, after arduously composing an introduction, she states: "I don't like this beginning" and crosses it out entirely, not attempting to salvage or patch up any of the paragraph. Again, depending on how bad this introduction was, the Choose strategy might be appropriate. However, nearly two-thirds of the way through the writing session, she again decides that what she is writing is not appropriate: "I can't say that. . . . it's true, but I can't say it." She decides once more to "begin again" and starts her introduction over for the fourth time.

By this point the Choose strategy of resolving conflicts no longer seems appropriate. The writer appears to be spinning her wheels, generating text, applying the "be interesting" and then the "be appropriate" criteria, followed by throwing away text because it failed to meet one of the criteria. She seems to be between a rock and a hard place, trying to be interesting (which she defines as being a little racy) and to meet the constraints of the magazine. Her goals seem non-negotiable: there is no indication that she considers ways these goals or constraints could be bent, adapted, or changed. This sequence of conflicts is illustrated in Figure 9.

In sharp contrast to this student's sequence is the path of the experienced writer, also shown in Figure 9, who resolves her goal conflicts mainly by generating New Plans or Consolidating. Like the student, she too sees a conflict between meeting constraints of the assignment and being interesting, but while the student seems bound to choosing one alternative or another, this writer has a more open and assimilating stance toward the goal conflicts. Rather than choose among alternatives, she generates a new plan which satisfies both goals: she decides to "talk about *why* [her emphasis] I chose the job" which she thinks will meet the assignment but still be interesting. Later she notes another conflict: her goal "don't be abstract" is in conflict with existing text. Rather than choose to continue the text or discard it completely, she decides to "move down the ladder from abstract to concrete"--to retain the existing abstract text, but add some specific examples to it. As shown in Figure 9, both conflicts are resolved by a creative--and conserving-- New Plan strategy.

CONFLICT	RESOLUTION STRATEGY
A Student Writer's Resolution Pattern	
Task-Specific Conflict • text-notes vs. • magazine constraints	*Choose* Delete text
Generic Conflict • text vs. • not tight, don't like it	*Choose* Delete text
Task-Specific Conflict • text vs. • magazine constraints	*Choose* Delete text
An Experienced Writer's Resolution Pattern	
Active Goal Conflict • meet assignment vs. • be interesting	*New Plan* Talk about why I chose my job
Task-Specific Conflict • text vs. • don't be abstract	*New Plan* Make it concrete
Active Goal Conflict • address woman like myself vs. • avoid issues of literature and reality	*Consolidate* Be honest, present message, be interesting to self and reader

Figure 9. Conflict Resolutions of a Student and Experienced Writer

This experienced writer's more fluid and negotiable goals also lead her to a Consolidation of several goals at another point of conflict. In talking about her decision to study English, she wants to "address women who have to apologize for reading Frost," yet she doesn't want to "take up the issue of Literature and Reality." This conflict appears to trigger an idea: "maybe it is [an issue one wants to take up], yes, I think it is." She decides she can in fact use this issue as a way to convince that audience that instead of apologizing "you can have what you want and it will be okay--much more satisfactory--than mere defiance." This new goal not only solves the immediate problem, but integrates several previously articulated plans and constraints including *meet the assignment, be interesting to the reader, be honest, and address a woman like myself.*

To sum up, the frequency with which these writers had to deal with explicit conflicts was impressive, especially when one imagines how many unarticulated ones must also occur. Sometimes conflicts are treated as local issues or as problems in written text, to be resolved by eliminating one of

the conflicting parties (whether in one's goals or in one's text). At other times, conflicts are treated as opportunities to build a more integrated or comprehensive plan or text. (The proliferation of new goals and constraints one sees in constructive planning may even make this something of a necessity.) However, it seems that conflicts become opportunities only if writers see their goals as negotiable and if they turn to strategies for resolution that create new and/or consolidated plans where appropriate. Although the actual number of such resolutions in any composing session may be small, their influence on productivity and the ability to meet one's own goals may be significant.

Constructive Planning and Expert Writers

Given the five critical features of the constructive planning strategy described above, what does it take to perform like an expert planner in writing? A good answer, we believe, will need to take the following observations into account.

The first observation is a theoretical one. The very nature of the planning process we have observed in writers contains a built-in dilemma. On the one hand, it encourages wide-ranging, even associative search, the proliferation of goals and subgoals, and opportunistic planning. On the other hand, the function of planning in writing is to go beyond a happy jumble of ideas or a set of locally linked paragraphs and to construct a hierarchically integrated, sharply focused text plan, one that forges content knowledge and rhetorical purpose into a new working unit. The writer's generative process and this goal seem to be at cross purposes. The expert planning process will be one that can somehow yoke these indispensable forces into a working team.

A second set of observations comes from our performance data in which experts are distinguished by not only the number of their goals but by the way in which they structure those goals. For this exploratory analysis we created detailed maps of the goal networks of nine writers: three experts, three student writers and three problem (student) writers, described in Section II. The goal networks included both goals (subgoals and plans) and evaluative comments that set criteria for plans, but they did not include what were judged to be local, sentence-level goals concerned with wording, sentence structure etc.

Mapping the goal network of an expert protocol is a lengthy process that necessarily depends on rater judgment and demands detailed knowledge of the protocol and the text. Therefore, we used this analysis as a hypothesis generator to create explicit, data-based predictions that are being explored in follow-up studies in other ways. The following descriptive statistics must be read with that limitation in mind. A formal test of reliability asked judges who didn't know the protocols to recognize those individual goals statements (taken out of context) which were pop-ups to previous goals out of a larger random selection of goal statements from the protocols. This check produced the following figures on various protocols: 80%, 81.%, 60%, 69% (conservative), and 48% (conservative). (The conservative scoring required a precise match to the original goal rather than one of its later reworded descendants or variations.). An informal reliability check between raters who knew a protocol (80%) suggested that disagreement was most likely to occur with the local placement of subgoals rather than major goals. Given these limitations, mapping goal networks appears to be a useful tool for reducing the daunting complexity of a verbal protocol to a meaningful pattern that lets one represent, in a condensed way, both the structure of the planning process and the knowledge it generates.

More Elaborate Goal Networks

Looking at the comparisons in Table 1, one is struck by the expert's clear trend toward more goals, greater elaboration. However, we do not believe that sheer bulk is a reliable indicator of expertise. Experts can use "smart" strategies to reduce the need for planning, such as drawing on well-learned schemas where possible or inserting pointers to packages of prior knowledge in their plan. Expert 2, for instance, streamlined her planning by organizing her text with a narrative about her own career decision. Nor did the experts and novices differ on the proportion of local, sentence level goals (e.g., "should I use that word") to the more general goals included on the network. The

amount of sentence-level planning may be a situational variable that depends on circumstances, such as how good a speller you are, how much you worry about it, or on how much attention you think the reader is going to pay to style or grammar and so on. To understand what gives experts their edge, we need to look at more than sheer quantity and examine the nature of the experts' elaboration.

	Goals*	Integration Score*	Links/ Goal*
Expert			
1	103	1286	12.5
2	43	499	11.6
3	80	539	6.7
Student			
1	42	263	6.2
2	59	303	5.1
3	63	182	2.9
Problem Writer			
1	35	164	4.7
2	38	150	3.9
3	19	26	1.5

Table 3. Integration of Writers' Working Goals

*Significant (Mann-Whitney)

One worry in interpreting any language performance is that the experts are simply more verbal. They are happy to talk on. Analyzing the talk, however, shows that some significant intellectual moves are absent from the novices' protocol talk: in doing revising, for instance, some novices may talk as much as the experts, but they still don't produce diagnoses (Hayes, et al., 1987); in planning, novices' energy goes into the active generation of content and review of the assignment, but not into the generation of new goals.

There are other reasons this elaboration of goals is meaningful. By their nature, protocols reveal the information that is receiving conscious, articulated attention during composing. It is reasonable to suppose that knowledge in that form will be more influential and more open to inspection and manipulation during planning than unarticulated notions which our novices may be depending on. Articulated knowledge is certainly not necessary to writing, but on demanding tasks the advantage seems to rest with the planner whose knowledge is in such accessible form. The protocols show us what appears to be an optional level of problem solving that goes beyond fluent text production.

Finally, this extra processing and elaboration of goals violates a reasonable expectation that expert writers would possess far more tacit knowledge and well-learned schemas . This would reduce their need to plan while it would boost the work the novice must do from scratch. In effect, we might expect the novices to produce less fluent text, but more planful protocols. This was not the case. This same tendency to elaboration is apparent in the revision process of expert writers. In the face of global or ill-defined problems in a text, the experts, who might be expected to know more solution strategies and move with dispatch, did far more diagnosis and problem-solving than did the novices (Flower, Carey & Hayes, 1986). It appears that the sheer verbal fluency which can produce longer texts or many alternative versions of a text is quite distinct from the productive problem-solving moves such as diagnosis, goal setting and evaluation we see in experts. Encouraging college age writers to "say more" does not appear to produce expert plans.

A better explanation for this elaboration, we believe, is that the experts are giving themselves a different and harder writing task from the very beginning. They have represented an ill-defined problem for themselves which by its nature involves more goals and more constraints. And their more elaborated planning reflects the increased problem-solving such problems would require.

Integration of the Goal Network

The above observations, which point to a qualitative difference behind the quantitative difference in elaboration, seem true as far as they go. However, a closer look at these networks suggests that experts also structure their planning differently.

One might predict that the networks of experts would show more *breadth* of development in the form of more parallel, high-level goals. However, this strategy assigns only limited importance to development. Although some experts did such broad exploration, others settled quickly on a good plan and carried it out. Alternatively, one might expect greater *depth* of development. Although this prediction was sometimes true, it was scuttled by those experts who did good top-level planning and then moved quickly to text by embedding a narrative schema or an episode of knowledge-telling within their plan. Since narratives are such well-learned schemas for most adults, little further planning and development was necessary. The more interesting pattern which we discovered reflected the overall *integration* of this network.

Experts, we observed, not only created more goals, but their networks formed larger clusters of goals that were connected at the top levels of the network. To measure this integration (see Table 1) we developed a scoring scheme that was weighted in favor of integration at the top levels. Although such weighting might not be relevant in calculating the general integration of a memory network, it is very important for evaluating a writing plan which has to be integrated at the top levels. For this scoring we mapped the goal networks of all nine writers. Figure 10 diagrams the overall structure of the 103 goal network examined in detail in Section III. Then we gave each goal in the network a score based on how many goals, below it in number, were connected to the goal being scored. The test was, "how many nodes could you get to from here without going back up in the goal tree?" A goal such as #10, #14 or #15 with clear connections to many later goals and goal families received a high score. This scoring gave weight to the combination of features we predicted would distinguish experts: the combination of elaborated clusters and strong interconnections at the top-levels of the network. It tended to penalize writers who produced a string of semi-independent goal clusters, even when the clusters themselves had many internal connections. This pattern in a writer's goal network is, we note, a close parallel to the topic shifts and patterns of local coherence but global disorganization seen in many student papers. Such papers often exhibit strong lexical cohesion and well-developed individual paragraphs, but appear confused at the level of overall purpose and logic. (*Note, this scoring reflects the integration of goal statements, planning statements and evaluative comments found in the protocol This is not an evaluation of the structure of the text or the writer's content knowledge.*)

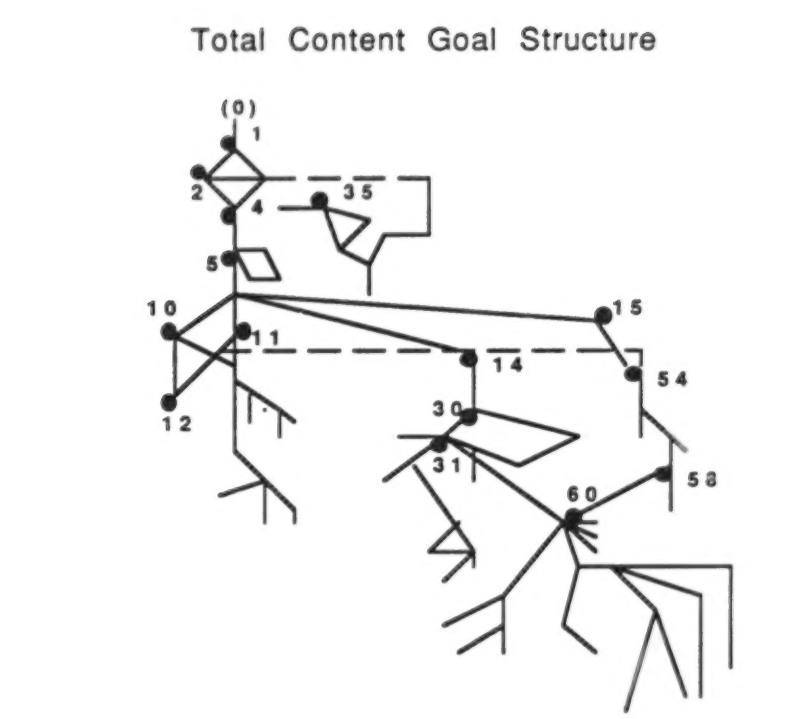


Figure 10. Total Content Goal Structure of Expert 1

The Integration score shown on Table 3 is the sum of the connection scores given to each goal on the writer's network. Notice Expert 2, the writer who relied on an efficient narrative structure in her plan . Even though she has fewer goals than two of the three students, her Integration score is much higher. The reason: her narrative was embedded in a more fully integrated and elaborated rhetorical plan. The Integration scores offer us a quantitative corroboration of the constructive process described in Section III of this paper. They are another indicator that the strategic effort to construct an integrated plan which we observed in experts has a visible outcome in the plan.

If we divide this Integration score by the number of goals a writer produced, we see a significant difference between these groups on the number of links per goal. Based on Table 3, we can see that the experts created an average of 10.3 links per goal, compared to the students' 4.7 and the problem writers' 3.4 links.

The frequency of events in Table 4 is too small to allow a strong hypothesis, but we did note that the experts were more likely to pop-up in their goal structures or return to previous goals and they were more likely to explicitly monitor progress on previous goals. These differences suggest a gulf between the experts and the novices (i.e., the students plus the problem writer groups). However, the three student writers did, in fact, do a credible job on this task and looked very much like the experts in another area. Although the experts had far more goals that had three or more links to another goal (62 expert to 34 student to 15 problem), both experts and able students had approximately 25% of such goals as part of their total goals (compared to 14 % for the problem writers.) The students, this suggests, may be carrying out some of the basic operations it takes to build integrated plans, but they are doing so with less elaboration or less thoroughness.

	Links/ Goal	Pop-Ups	Monitors	3 + Links / Goal (%)
Experts	10.3	15	15	62 (28%)
Students	4.7	6	6	34 (22%)
Problem Writers	3.4	5	3	15 (14%)

Table 4. Presence of Integrating Activities: Group Averages

Conclusions

In this study we looked at planning in order to understand more about the task demands of complex expository writing and to develop a tentative, data-based theory about the strategies of constructive planning. We feel this cognitive and rhetorical perspective is an important addition to our knowledge of how writers plan, because the more easily observable process of selecting and organizing content has tended to obscure the underlying processes of goal-setting and rhetorical problem-solving which may contribute vigorously to successful writing.

In the constructive planning process which we have proposed:

- Constructive planning can be defined, in part, as a theory of the task, a process which reflects the planning demanded by the ill-defined nature of rhetorical problems.
- Expert writers appear to be marked by their willingness to turn to constructive planning when the task calls for it and by their ability to embed other planning strategies, such as a knowledge-telling or a schema-filling strategy, within a unique rhetorical plan.
- In constructive planning writers draw on both exploratory and opportunistic strategies and on goal-directed attempts to search and develop ideas and plans. These strategies reflect the dual and often contradictory need to foster invention and to produce a coherent, integrated plan and text.
- Expert writers appear to manage this contradiction with strategies for integration and conflict resolution which allow them to forge connections and build an integrated network of goals and plans.
- Finally, we can characterize some differences between experts and novices by envisioning a writing task as a literal problem space--a territory which the writer must traverse. Looking at how writers manage the five critical features discussed above suggests four typical paths through this territory.

Path #1, the knowledge-driven path, begins with a simple task representation which defines the writing problem as a task of presenting content knowledge. The virtue of this path is that it requires little elaboration of goals and the writer rarely encounters conflicts within his or her own knowledge. If, however, the task is a complex one with real, though unrecognized constraints, the quality of the final text will be judged low.

Path #2, the schema-driven path, also begins with a relatively simple representation of the task as filling a script or schema (generally in addition to knowledge-telling). It too can chart a fast and efficient route through the task. However, this initial complication of the task and the demands of a discourse convention sometimes produces conflicts (even though the writer may do minimal

further planning and goal setting). For example, one "problem writer" in our study was caught in the hopeless dilemma of presenting what he saw as a male job in computer engineering in "girls language." Writers on this schema-filling path recognize conflicts, but in their reluctance to turn to a constructive strategy, their typical response is to drop the problem or switch from one side of the conflict to another. The result is a plan that falls short of its own goals and criteria.

Path #3, a high-knowledge path, begins with the representation of a realistically complex task, but a task for which the experienced writer possesses an adequate script or schema or for which the writer's knowledge is already well adapted. We have been told, for instance, that there are some experienced writers for whom the task of writing letters of recommendation falls in this category. Assuming that the writer's script or knowledge really is pre-adapted and appropriate, this path would lead to a high quality text with relatively little effort spent in elaborating goals or resolving conflicts. This path might also be the sensible route to a "satisfactory" text that falls short of certain criteria the writer is aware of but doesn't have the time or inclination to meet. Here the experienced writers' richer domain knowledge of rhetoric, of texts, or of discourse patterns stands them in good stead, since it can take the place of constructive planning a developing writer might need to do to produce an acceptable text.

Path #4, the high-planning route, is the path of constructive planning. It begins with a complex task which the writer elaborates and explores throughout composing. The side trips to script-filling and/or knowledge telling may make the process more efficient, but they too create the potential for conflicts and the need for consolidation and integration of plans. The active problem-solving this path entails can have mixed results, since it can lead to high quality texts that meet the demands of the reader and rhetorical situation. It can also lead the writer through an extended composing process and considerable rethinking. It appears that the path to effective writing is not always straight, nor the gate wide.

IV. PLANNING AIDS FOR WRITERS: GOALS FOR INSTRUCTION AND SUPPORT

One reason to study the planning process is to help writers improve their own process. For inexperienced writers this might involve direct instruction in some of the powerful planning strategies that seem to be missing in the novices' process and/or in their representation of the task of planning. Since inexperienced writers often do very little planning and tend to identify writing with text production, instruction in strategies for analyzing a reader, setting rhetorical goals, or dealing with conflicts during planning might increase both their repertoire and vision of the task. Another form of aid would more properly be termed a support for the planning process itself. An on-line computer aid or a heuristic (such as journalism's 5Ws) can not only teach new strategies, but can help experienced writers keep track of information and monitor their own plans.

However, in designing a computer support or giving advice, we must remember that we are imposing an implicit theory of planning on a complex social and cognitive process. This study has described an expert constructive process that is not only opportunistic and recursive, but strategic--a more complex process than traditional planning advice would have suggested. The challenge to educators and educational technology is to design planning aids that can support an *expert* process. Supports built on simpler notions of planning may have the power to depress performance to their own level of sophistication.

The planning aids we have in mind for instruction and support range from simple non-directive prompts to plan, to tool kit approaches that teach an expanded repertoire of strategies, to more complicated environments in a classroom or on-line that can model, prompt, and help writers monitor planning.

Five Goals for Creating Aids to Planning

1. Planning is a strategic process. When we teach expert moves, such as constructive planning, or design computer supports, we must also help writers embed these moves *within* a larger social and cognitive process that might include collaboration, "unplanned" exploratory drafts, or comments from a reader.

Expert planning strategies in writing must act in *response* to a social and rhetorical context, on a problem that develops *during* the act of planning. This means that planning aids must focus on strategic choice within a rhetorical situation rather than try to model or dictate a prototypical overall path for the planning process. For instance, a step-by-step planning procedure could have initial value as a teaching tool or for very well-defined, limited tasks. However, in dictating a linear process, such steps eliminate--or at the least, fail to model--the goal-directed search, the flexible way different planning moves are embedded in one another, and the strategic decisions that guide the process. The price of simplicity could be a planning aid that subverts the recursive and opportunistic process we see in experts.

2. A planning aid needs to support different executive planning strategies--and recognize the fact that writers switch among these strategies as they work. That is, given the distinctive costs and benefits of knowledge-driven, schema-driven, and constructive planning, writers need to make strategic decisions that can manage this planning process and flexibly embed these strategies within one another.

As we saw in the discussion of how instructional texts are typically planned and written, even texts that appear based on a well-formed schema may require constructive planning at key points in the writing process. In the case of procedural instructions, the planning process that is described in texts and institutionalized in the way many companies and government departments operate tends to encourage unmediated knowledge-telling or schema-filling while it short-circuits the more global, rhetorical and constructive planning that should guide these other strategies.

3. A third goal suggested by this study is one which traditional approaches to planning almost never achieve. This aid would give objective status to *both* outputs of the planning process--that is, to both content information and goals.

The writers we observed often had difficulty remembering and manipulating their own growing networks of partially integrated plans, goals and criteria. Traditional approaches to planning, such as outlining or freewriting, implicitly define the process of planning in terms of the process of producing text. These techniques provide a record of content ideas and textual organization that writers obviously need to keep track of information and consider alternatives. However, such text-based records provide little hint of the changing network of goals and rhetorical plans we see writers making and forgetting. Outlines and other text-based forms of *aide memorie* are a poor reflection of that planning process--they give novice writers little indication that such a constructive process exists, and they give constructive planners little support for reflecting upon their own alternative plans and goals. Support which makes this network more visible might also make it more revisable.

4. Planning aids need to concentrate help on those cognitive operations that make planning difficult. This study suggests that the processes of ***monitoring*** and ***consolidating*** one's plans are not only intellectually demanding but a source of problems.

We use the term ***monitoring*** to include a variety of related operations that keep information active or accessible, especially on a dynamic representation such as a writer's plan. Protocols show us a number of situations in which monitoring is critical. As mentioned in the point above, writers frequently need to recover their goals, especially after they return from trips deep into long term memory to generate ideas or from concentration on a local problem. This also means recalling the

structure of their goals, especially when a series of modifications within a goal family make the different versions merge together. Protocols show repeated instances of writers (even in a one hour task) forgetting to attend to major goals (which sometimes turn up later to trouble them) and losing needed workable plans after an interruption.

Writers also need, it seems, to recall previous plans even after new, supposedly better, ones are generated. Many plans look good in the abstract but fail when the writer tries to instantiate them. For instance, the code words (or pointers to a package of ideas in memory) described in Section III may make a good plan, but on inspection, the writer discovers she has only a nickel's worth of knowledge in that package, or that a good rhetorical plan is just too difficult to carry out in the space available. Because instantiation is such an important test in writing, and because plans do fail, writers often need to recover trial plans. Finally, the process of intention setting depends on the writer's ability to put information that he can't currently integrate or intentions he can't yet see how to act upon on hold. Intention setting lets writing be both opportunistic and integrated , but it only works if the writer can recall intentions and monitor changes in the plan at a global level.

Constructive planning also depends on a writer's ability to actively manage and integrate information--a variety of processes we can describe as ***consolidating.*** The experts in our study often relied on notes which pointed to goals, global organization plans, or audience features. A planning aid targeted on the difficult process of consolidation might go beyond review and help writers to form gists or reduce their text to manageable chunks of ideas, to develop local connections, and to fit new, locally-generated ideas into the global structure of their plan. An aid might also help if it could stimulate the sort of periodic review and consolidation and conflict resolution we saw in experts. Finally, it might help writers manage conflicts rather than be buffeted by them.

However, just what sort of support is needed for college age and older writers? To what extent do we need to teach such processes themselves; do we need to show writers how to review a draft text to extract its gist or topical structure? Or could we make a significant difference by focusing on metacognitive processes? We know that even college students with twelve years of schooling bring widely divergent task representations to academic assignments (Flower *et al.*, in press). Even on familiar tasks much of the process that leads to success on such assignments may be invisible to students who have constructed their own incomplete theory of what readers expect and how the writing process should operate. It may be that instruction which could support a metacognitive awareness of the planning process alone could lead to important changes in performance. Whatever the necessary balance will be, this study suggests that metacognitive awareness plays an important role in expert performance at two levels. First, these writers devote time and attention to planning and the construction of a new work of plans and goals. Their plan has the status of a product that guides writing. Secondly, in the face of problems or at decision points, these writers rise to a heightened awareness of their own process and of their own plans. They see plans as a object for reflection and as open to review, revision, and consolidation.

5. Finally, planning aids need to be flexible enough to accommodate two facts: 1) writers' plans develop over time and may change in their structure during the writing process and 2) writers may take significantly different paths in developing these plans.

For instance, the writer whose goal network we examined in Section III offers a good example of a plan-and-instantiate path. He began with a relatively complex, global plan, which he then attempted to instantiate in text. During the process, this writer's top-level goals remained stable, although he created and rejected a number of alternative mid-level goals and possible instantiations of those goals at all levels. We should also note that multiple goals often converged on a given piece of text, such as the anecdote about the first day of class, which 1) served his organizational plan to "clue them in," 2) allowed him to demonstrate a shared anxiety, and 3) as we learn from the protocol, let him carry out a private plan to "shake 'um up" and change their notion of English teachers. For this writer, the goal structure was a complex entity which was energetically constructed, frequently elaborated, and heavily used, but only partly captured in his notes. His ability to keep the structure in

mind and his habit of reviewing and verbally reconstructing it from time to time probably contributed to his efficiency in producing a tightly structured, persuasive piece.

Other writers in this study follow quite different and equally successful paths of development which we might characterize as an elaborate-and-consolidate path. Writers on this path begin with only a sketchy global plan before they plunge into writing a draft or even sections of final prose. The critical point in their planning process comes when they then review the results, treating that prose as an elaborated plan. These writers may quickly abandon their draft texts, consolidating what they have learned, and transferring the elements they like to a new draft. Or, like the writer who moved quickly into a schema-driven plan for writing a subversive personal narrative, which she then saw was in conflict with other goals for this task, the writers may depend on periodic episodes of planning, conflict resolution, and consolidation. Writers on this path can follow where imagination or local opportunities lead them, but the price is that they must be able to see the gist or essence of what they have written, to see how it fits with other plans, other pieces of text, and then be able to consolidate their work into new whole.

The less experienced writers in this study show us how this process can go awry. They too plunged into text and went through a series of fresh starts. However, as Carey et al. shows, the *quality* of writers' initial planning, even if it is brief, is important. The effective writers (student and expert) used their planning time to consider the entire rhetorical problem so that even this path, which relies on low initial planning, was guided by a rhetorically-based, if abstract plan. Secondly, the novice writers we saw here rarely if ever turned to consolidation to resolve conflicts or to guide writing when their current momentum lapsed.

On the surface, the planning process based on the elaborate-and-consolidate path could look much like a series of fresh starts or writing as inspiration leads. The significant cognition that separates experts and novices will not be readily apparent to inexperienced writers. Moreover, consolidation can be a demanding intellectual move. If we wish to help people plan, we must not only support the complex process of constructing a plan that can integrate one's goals, plans and text, but we must make this strategic process itself visible as a critical force in effective writing.

NOTES

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